Maternal Mental Illness, Infant Growth and Infant Psychomotor Functioning in Rural Masaka District, Uganda: A Longitudinal Cohort Study

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Declaration

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Abstract

Background: Maternal mental illness (postpartum depression, generalised anxiety disorder [GAD] or Acute Adjustment Disorder with Anxiety (AADA), and comorbidity of maternal postpartum depression and GAD) occur during a critical stage in the infant's life. It is a stage in life when the infant psychomotor functioning and growth is likely to be affected by maternal mental illness. The purpose of the study was to investigate the association between maternal mental illness at six weeks and six months postpartum, infant growth and infant psychomotor functioning in rural Masaka district.

Methods: A longitudinal cohort study design was used and quantitative methods used for data collection and analysis. Mother-infant dyads were assessed at six weeks postpartum (baseline) and followed up when the infants were six months old (follow-up). A total of 167 and 149 mother-infant dyads were investigated at baseline and follow-up, respectively. Postpartum depression, GAD, and comorbidity of maternal postpartum depression and GAD) was measured using the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV Axis I Disorders–Research Version–Non-Patient Edition (SCID-I-RV/NP), The Edinburgh Postnatal Depression Scale (EPDS) and The Self-Reporting Questionnaire (SRQ-20). Relationship discord was measured using the Relationship Dynamics Scale (RDS) while Social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS). Poverty was measured using an asset register Infant growth was measured using a portable digital weighing scale and with a tape measure. Psychomotor development was measured using the Kilifi Developmental Inventory (KDI) and the Developmental Milestones Checklist (DMC).

Data was analysed using the IBM Statistical Package for the Social Sciences (IBM SPSS Version 23) computer program. The WHO's ANTHRO software (World Health Organization, 2011) was used for the anthropometric calculations. In the bivariate analysis,

Independent Sample T-test, Analysis of variance (ANOVA), and Pearson chi-squared test were used. Variables that were found to have an association were further analysed using multivariate logistic regression analysis. Receiver operating characteristic (ROC) analysis was used for the validation of the EPDS and SRQ-20.

Results: At baseline (six weeks postpartum), approximately one-third of the participants (34.70%) were diagnosed with a major depressive episode while less than a quarter (22.75%) of the participants met the criteria for AADA. The comorbidity rate for participants who had both maternal depression and maternal AADA at baseline was 16.20%. There was a significant association between maternal depression and marital status.X^2 (1, N = 167) = 4.4, p = .036. There was a significant difference in weight for age (WAZ) for participants with maternal psychological distress (M= -.50 SD=1.28) and those without (M=-.13 SD=1.02) t (165) = 2.08, p = 0.039. Participants' poverty and maternal depression were significantly associated X^2 (4, N = 167) = 11.21, p = .024.There was a significant association between relationship discord and maternal mental illness (depression X^2 (1, N = 167) = 4.39, p = .036, anxiety X^2 (1, N = 167) = 7.43, p = .006, psychological distress X^2 (1, N = 167) = 21.87, p = <.001 and comorbidity X^2 (2, N = 167) = 8.59, p = .012). There was a significant association between social support and maternal depression X^2 (1, N = 167) = 7.33, p = .007. Social support was also significantly associated with maternal psychological distress X^2 (1, N = 167) = 4.44, p = .035.

At follow-up (six months postpartum), 14.09% of the participants met the criteria for major depressive episode whereas only 6.71% of the participants met the criteria for GAD. The comorbidity rate for participants who had both maternal depression and maternal GAD during the follow-up period was 3.4%. There was a significant difference in WAZ for infants whose mothers were depressed (M= -.95, SD=1.52) and those whose mothers were not depressed (M= -.18, SD=1.15), t (147) = 2.72, p = 0.007). There was a significant difference

in weight for height Z-score (WHZ) for infants whose mothers were depressed (M= .60, SD=1.53) and those whose mothers were not depressed (M= 1.28, SD=1.28), t (147) = 2.17, p = 0.032). There was a significant difference in WAZ for infants at six months postpartum whose mothers were exclusively breastfeeding at six weeks postpartum(M= -.18, SD=1.25) and those whose mothers were not (M= -.84, SD=1.00), t (147) = 2.43, p = 0.016). There was a significant difference in WHZ for infants at six months postpartum whose mothers were exclusively breastfeeding at six weeks postpartum(M= 1.28, SD=1.36) and those whose mothers were not (M= .68, SD=1.12), t (147) = 2.03, p = 0.044).

There was a significant difference in language development of Infants whose mothers were depressed at six weeks postpartum (M= 3.88, SD=1.06) and those whose mothers were not depressed (M= 4.32, SD=1.23), t (147) = 2.17, p = 0.031). There was a significant difference in language development of Infants whose mothers were psychologically distressed at six weeks postpartum (M= 3.83, SD=1.14) and those whose mothers were not (M=4.40, SD=1.17), t (147) = 2.91, p = 0.004). Maternal depression at six weeks postpartum was associated with maternal depression at six months postpartum X^2 (1, N = 149) 3.89, p = .049. Maternal AADA at six weeks postpartum was associated with maternal depression at six months postpartum X^2 (1, N = 149) 4.90, p = .027. Maternal psychological distress at six weeks postpartum was associated with maternal depression at six months postpartum X^2 (1, N = 149) 18.16, p = < .001. Maternal psychological distress at six weeks postpartum was associated with maternal GAD at six months postpartum X^2 (1, N = 149) 11.02, p = < .001. Maternal psychological distress at six weeks postpartum was associated with maternal psychological distress at six months postpartum X^2 (1, N = 149) 7.61, p = < 006. Maternal psychological distress at six weeks postpartum was associated with comorbidity at six months postpartum X^2 (3, N = 149) 23.20, p = < .001. There was a significant association between poverty and maternal psychological distress X^2 (4, N = 149) 11.73, p = .019. There was a

significant association between relationship discord at six months postpartum and depression X^2 (2, N = 149) 24.50, p = <.001. Furthermore, there was a significant association between relationship discord at six months and maternal psychological distress X^2 (2, N = 149) 18.84, p = <.001. There was also a significant association between relationship discord at six months and comorbidity of maternal depression and maternal GAD X^2 (2, N = 149) 30.45, p = <.001.

Results from the DMC showed that a strong positive correlation between psychomotor functioning and social support r(147)=.189 p=.021. KDI results showed no significant relationship between psychomotor functioning and relationship discord or social support r(147)=.273 p=.001. Relationship discord at six weeks postpartum was negatively related with locomotor functioning on the KDI at six months postpartum r(147)=-.194 p=.018. On the DMC, relationship discord at six weeks postpartum was negatively correlated with language development at six months postpartum r(147)=.-.179p=.029

As far as effectiveness of Screening Tools for Depression was concerned, the ROC analysis was run for the EPDS and SRQ-20 using the SCID as a gold standard for diagnosis. The results of ROC analysis for the EPDS and the SCID show that the EPDS at the baseline had an AUC of 0.92 (95% CI: 0.88–0.97) with a standard error of 0.22 while the results of ROC analysis for the SRQ-20 at the baseline had an AUC of 0.78 (95% CI: 0.69–0.86) with a standard error of 0.042, indicating fair accuracy. The results of ROC analysis show that the EPDS with an ROC area of 0.92 performed significantly better as a screening tool for depression than the SRQ-20, which had an ROC area of 0.87

Multiple logistic regression was performed to find out which predictor variables were strongest in predicting maternal mental illness. For maternal depression at six weeks postpartum three independent variables – SSE, relationship discord and social support – were included in the analysis. The strongest predictor of maternal depression was relationship

discord with an odds ratio of 1.17. For maternal psychological distress at six weeks postpartum, relationship discord and social support were assessed as predictors for maternal psychological distress. Relationship discord significantly contributed to the model and was the strongest predictor of maternal psychological distress with an odds ratio of 1.4. Relationship discord at six months, relationship discord at six weeks, maternal psychological distress at six weeks, maternal AADA at six weeks and maternal depression at six weeks were included in the analysis as independent variables for maternal depression at six months. The strongest predictor of maternal depression at six months was relationship discord at six months, recording an odds ratio of 1.18. Poverty, maternal psychological distress at six weeks postpartum and relationship discord were included in the analysis as predictors for psychological distress. The strongest predictor of maternal psychological distress was poverty, recording an odds ratio of 9.23.

Conclusion: This study shows that maternal mental illness is a significant predictor of infant growth and psychomotor development in rural Uganda. The research provides useful information regarding the factors that impact maternal mental health provision of system interventions within the communities, that is critical for averting adverse impacts of maternal mental illness on the infant's growth and infant psychomotor functioning. A high level of prevalence for maternal mental illness in rural areas was observed as compared to urban settings in other studies. This study informs and improves our understanding of infant growth and infant psychomotor functioning, providing evidence for interventions at the psychological, social and public health levels that focus not only on the participants but also on the infants.

Opsomming

Agtergrond: Moederlike geestesiektes (Nageboorte depressie, Algemene angsversteuring (GAD) of Akute Aanpassingsversteuring met Angs, en komorbiditeit van moederlike nageboorte depressie en GAD) gebeur gedurende ’n kritiese stadium van ’n baba se lewe. Gedurende die stadium van die baba se lewe kan die baba se psigomotoriese funksionering en groei geaffekteer word deur moederlike geestesiektes. Die doel van die studie was om die verband tussen moederlike geestessiektes (op ses weke en ses maande na geboorte) en die groei van die baba en baba-psigomotoriese funksionering in die landelike Masaka-distrik te ondersoek.

Metodes: ’n Longitudinale kohortstudie-ontwerp en kwantitatiewe metodes was gebruik vir data-insameling en analise. Moeder-baba paartjies was op ses weke na geboorte (basislyn) geassesseer en is opgevolg toe die babas ses maande oud was (opvolg). In totaal was 167 en 149 moeder-baba paartjies geasseseer gedurende basislyn en opvolg ondersoek. Nageboorte depressie, GAD, en comorbiditeit van moederlike nageboorte depressie en GAD was gemeet deur die Gestruktureerde kliniese onderhoud vir diagnostiese en statistiese handleiding vir geestesversteurings IV As I-steurings - Navorsingsweergawe - Nie-pasiënt-uitgawe (SCID-I-RV / NP), Die Edinburgh Postnatale Depressieskaal (EPDS) en Die selfrapporteringsvraelys (SRQ-20). Verhoudings-onmin was gemeet deur die gebruik van die Verhouding Dinamiek Skaal (RDS), terwyl sosiale ondersteuning gemeet was met behulp van die Multidimensionele Skaal van Ervare Sosiale Ondersteuning (MSPSS). Armoede was gemeet deur die gebruik van ’n bateregister. Die groei van die baba is gemeet met ’n digitale weegskaal en met ’n maatband. Psigomotoriese ontwikkeling is gemeet deur gebruik te maak van die Kilifi Ontwikkelings Inventaris (KDI) en die Kontrolelys vir Ontwikkelingsmylpale (DCM). Data is geanaliseer met behulp van die IBM Statistical Package for the Social Sciences (IBM SPSS Version 23) rekenaarprogram. Die WGO se ANTHRO-sagteware

(World Health Organization, 2011) is gebruik vir die antropometriese berekeninge. In die tweeveranderlike analise is onafhanklike monster-T-toets, variansie-analise (ANOVA) en Pearson chi-kwadraat-toets gebruik. Waar daar gevind is dat veranderlikes ’n assosiasie met mekaar het, was die veranderlikes verder geanaliseer met behulp van meerveranderlike logistieke regressie-analise. Ontvanger-bedryfskenmerkanalise (ROC) -analise is gebruik vir die validering van die EPDS en SRQ-20.

Resultate: Aan die beginpunt (ses weke na geboorte) is ongeveer 'n derde van die deelnemers (34,70%) gediagnoseer met 'n ernstige depressiewe episode, terwyl minder as 'n kwart (22,75%) van die deelnemers aan die kriteria vir AADA voldoen het. Die comorbiditeitskoers vir deelnemers wat beide moederlike depressie en AADA was 16,20%.

Daar was 'n beduidende verband tussen moederlike depressie en huwelikstatus X2 (1, N = 167) = 4.4, p = .036. Daar was 'n beduidende verskil in gewig vir ouderdom (WAZ) vir deelnemers met moederlike sielkundige nood (M = -.50 SD = 1.28) en dié sonder (M=-.13 SD=1.02) t (165) = 2.08, p = 0.039. Deelnemers se armoede en moederlike depressie was beduidend geassosieer X2 (4, N = 167) = 11.21, p = .024. Daar was ’n beduidende verband tussen verhoudings-onmin en die geestesongesteldheid van die moeder (depressie X2 (1, N = 167) = 4.39, p = .036, angs X2 (1, N = 167) = 7.43, p = .006, sielkundige nood X2 (1, N = 167) = 21.87, p = <.001 and comorbiditeit X2 (2, N = 167) = 8.59, p = .012). Daar was 'n beduidende verband tussen sosiale ondersteuning en moederlike depressie X2 (1, N = 167) = 7.33, p = .007. Sosiale ondersteuning was ook beduidend geassosieer met moederlike sielkundige nood X2 (1, N = 167) = 4.44, p = .035. Na opvolging (ses maande na geboorte) het 14,09% van die deelnemers aan die kriteria vir ’n ernstige depressiewe episodes voldoen, terwyl slegs 6,71% van die deelnemers aan die kriteria vir GAD voldoen het. Die komorbiditeitskoers vir deelnemers wat tydens die opvolgperiode beide moederlike depressie en GAD gehad het, was 3,4%. Daar was 'n beduidende verskil in WAZ vir babas wie se

moeders depressief was (M = -.95, SD = 1.52) en die wie se moeders nie depressief was nie (M = -.18, SD = 1.15), t (147) = 2.72, p = 0,007). Daar was 'n beduidende verskil in gewig vir hoogte Z-telling (WHZ) vir babas wie se moeders depressief was (M = .60, SD = 1.53) en die wie se moeders nie depressief was nie (M = 1.28, SD = 1.28), t (147) = 2,17, p = 0,032). Daar was 'n beduidende verskil in WAZ vir babas op ses maande na geboorte wie se moeders eksklusief geborsvoed het (M = -.18, SD = 1.25) en die wie se moeders nie het nie (M = -.84, SD = 1.00) , t (147) = 2,43, p = 0,016). Daar was 'n beduidende verskil in WHZ by babas op ses maande na geboorte waarvan die moeders eksklusief op ses weke na geboorte geborsvoed het (M = 1.28, SD = 1.36) en die wie se moeders nie was nie (M = .68, SD = 1.12), t (147) = 2,03, p = 0,044). Daar was 'n beduidende verskil in taalontwikkeling in babas wie se moeders depressief was na ses weke na geboorte (M = 3,88, SD = 1,06) en dié wie se moeders nie depressief was nie (M = 4,32, SD = 1,23), t (147) = 2,17 , p = 0,031). Daar was 'n beduidende verskil in taalontwikkeling by babas wie se moeders sielkundig angstig was op ses weke na geboorte (M = 3,83, SD = 1,14) en dié wie se moeders nie was nie (M = 4,40, SD = 1,17), t (147) = 2,91 , p = 0,004).

Moederlike depressie, op ses weke na geboorte, is geassosieer met moederlike depressie op ses maande na geboorte X2 (1, N = 149) 3.89, p = .049. Moederlike AADA, op ses weke na geboorte, is geassosieer met moederlike depressie op ses maande na geboorte X2 (1, N = 149) 4.90, p = .027. Moederlike sielkundige nood, op ses weke na geboorte, word geassosieer met moederlike depressie op ses maande na geboorte X2 (1, N = 149) 18.16, p = < .001. Moederlike sielkundige nood, op ses weke na geboorte, word geassosieer met moederlike GAD op ses maande na geboorte X2 (1, N = 149) 11.02, p = < .001. Moederlike sielkundige nood, op ses weke na geboorte, word geassosieer met moederlike sielkundige nood op ses maande na geboorte X2 (1, N = 149) 7.61, p = < 006. Moederlike sielkundige nood, op ses weke na geboorte, is geassosieer met komorbiditeit op ses maande na geboorte

X2 (3, N = 149) 23.20, p = < .001. Daar was 'n beduidende verband tussen armoede en sielkundige nood by moeder X2 (4, N = 149) 11.73, p = .019. Daar was 'n beduidende verband tussen die verhouding-onmin, op ses maande na geboorte, en depressie X2 (2, N = 149) 24.50, p = <.001. Verder was daar 'n beduidende assosiasie tussen verhoudings-onmin op ses maande en moederlike sielkundige nood X2 (2, N = 149) 18.84, p = <.001. Daar was ook 'n beduidende verband tussen die verhoudings-onmin op ses maande en die komorbiditeit van moederlike depressie en moeder GAD X2 (2, N = 149) 30.45, p = <.001. Resultate van die DMC het getoon dat 'n sterk positiewe verband tussen psigomotoriese funksionering en sosiale ondersteuning r(147)=.189 p=.021. KDI-resultate het geen noemenswaardige verwantskap getoon tussen psigomotoriese funksionering en verhoudingsversoening of sosiale ondersteuning nie r(147)=.273 p=.001. Verhoudings-onmin by ses weke na geboorte was negatief verwant aan die lokomotoriese funksionering op die KDI op ses maande na geboorte r(147)=-.194 p=.018. Op die DMC was verhoudings-onmin op ses weke na geboorte negatief gekorreleer met taalontwikkeling op ses maande na geboorte r(147)=.-.179p=.029. Wat die effektiwiteit van siftingshulpmiddels vir depressie betref, is die ROC-analise uitgevoer vir die EPDS en SRQ-20 met behulp van die SCID as 'n goue standaard vir diagnose. Die resultate van ROC-analise vir die EPDS en die SCID toon dat die EPDS aan die basislyn 'n AUC van 0,92 (95% KI: 0,88–0,97) gehad het met 'n standaardfout van 0,22, terwyl die resultate van ROC-analise vir die SRQ-20 op die basislyn het 'n AUC van 0,78 (95% CI: 0,69–0,86) met 'n standaardfout van 0,042, wat 'n aanduiding is van billike akkuraatheid. ie resultate van ROC-analise toon dat die EPDS met 'n ROC-area van 0,92 aansienlik beter gevaar het as 'n siftingsinstrument vir depressie as die SRQ-20, wat 'n ROC-area van 0,87 gehad het.

Veelvuldige logistieke regressie is uitgevoer om vas te stel watter voorspellerveranderlikes die sterkste was in die voorspelling van geestesongesteldheid van

die moeder. Vir moederlike depressie, op ses weke na geboorte, is drie onafhanklike veranderlikes - SSE, verhoudings-onmin en sosiale ondersteuning - by die ontleding ingesluit. Die sterkste voorspeller van moederlike depressie was verhoudings-onmin met 'n kansverhouding van 1,17. Vir moederlike sielkundige nood, op ses weke na geboorte, is 'n verhoudings-onmin en sosiale ondersteuning beoordeel as voorspellers vir moederlike sielkundige. Verhoudings-onmin het 'n belangrike bydrae gelewer tot die model en was die sterkste voorspeller van sielkundige nood by moeder met 'n kansverhouding van 1,4. Verhoudings-onmin op ses maande, sielkundige nood op ses weke, moederlike AADA op ses weke en die moederlike depressie op ses weke is by die ontleding ingesluit as onafhanklike veranderlikes vir moederlike depressie op ses maande. Die sterkste voorspeller van moederlike depressie op ses maande was verhouding-onmin op ses maande, met 'n kansverhouding van 1,18. Armoede, moederlike sielkundige nood op ses weke na geboorte en 'n verhoudings-onmin is by die ontleding ingesluit as voorspellers vir sielkundige nood. Die sterkste voorspeller van sielkundige nood by moeders was armoede, met 'n kansverhouding van 9,23.

Afsluiting: Hierdie studie wys dat moederlike geestesongesteldheid 'n beduidende voorspeller van babagroei en psigomotoriese ontwikkeling in landelike Uganda is. Die navorsing verskaf nuttige inligting rakende die faktore wat ’n impak het op moederlike geestesgesondheid van stelselintervensies in die gemeenskappe wat van kritieke belang is om nadelige gevolge van moederlike geestesongesteldheid te voorkom op die baba se groei en baba se psigomotoriese funksionering. ‘n Hoë voorkoms van geestesongesteldheid in moeders op die platteland is waargeneem in vergelyking met stedelike omgewing in ander studies. Hierdie verbeter ons begrip van babagroei en baba-psigomotoriese funksionering, en lewer bewyse vir intervensies op die sielkundige, sosiale en openbare gesondheidsvlak wat nie net op die deelnemers nie, maar ook op die babas fokus.

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Dedication

I dedicate this dissertation to

My lovely daughters Elisy Ndagire, Erica Namubiru and Evana Nassuna. You inspire me to do better every day. Thank you!

Table of Contents

List of Figures

List of Tables

List of Abbreviations

AADA: acute adjustment disorder with anxiety

AUC: area under the curve

CMD: common mental disorders

DHS: demographic health survey

DMC: Developmental Milestones Checklist

DSM-IV – TR: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision

EPDS: Edinburgh Postnatal Depression Scale

GAD: generalised anxiety disorder

GDP: gross domestic product

HAZ: height for age Z-score

HIC: high-income countries

IRB: institutional review board

KDI: Kilifi Developmental Inventory

KEMRI: Kenya Medical Research Institute

LMICs: low- and middle-income countries

MSPSS: Multidimensional Scale of Perceived Social Support

PAC: principal component analysis

PPCT: Process-Person-Context-Time Model

RDS: Relationship Dynamics Scale

ROC: receiver operating characteristic

SCID-I-RV/NP: Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders IV* Axis I Disorders–Research Version–Non-Patient Edition

SHSREC: School of Health Sciences Research and Ethics Committee, College of Health Sciences at Makerere University

SRQ-20: self-reporting questionnaire

UBOS: Uganda Bureau of Statistics

UNCST: National Council for Science and Technology, Uganda

VHTs: village health teams

WAZ: weight for age Z-score

WHO: World Health Organization

WHZ: weight for height Z-score

Glossary

comorbidity: the simultaneous occurrence of major depressive disorder and generalised anxiety disorder (GAD) in a mother during the postpartum period.

Fine motor skills: refer to the infants ability to make small movements in their lips and tongue, feet, wrists, hands, fingers, toes,

generalised anxiety disorder: a long-term psychological disorder characterised by excessive feelings of being anxious for many days which significantly affects one's social relationships and work.

Gross motor skills: refers to the infants development of muscles that enable them to sit or crawl, hold up their heads and eventually walk, jump, run and skip.

infant growth: the decelerated physical growth of the infant which focuses on weight for height Z-score (WHZ), weight for age Z-score (WAZ), and height for age Z-score (HAZ); sometimes referred to as failure to thrive.

maternal mental illness: which is also commonly know as common mental disorders refers to a mother's state of well-being, which affects how she copes with daily stresses of life in which she is productive and able to contribute to the community; it is not absence of mental illness but rather the ability to adapt and cope.

motor development: refers to the infants physical growth and or strengthening of a infant's muscles, bones, and ability to touch and move his/her surroundings.

postpartum depression: a mood disorder that occurs four weeks after giving birth and is characterised by low energy, changes in eating and sleeping patterns, irritability, crying episodes and extreme sadness.

psychological distress: a set of conditions that include depression, anxiety, neurotic, stress and somatoform disorders which sometimes do not meet the precise criteria for diagnosis. The symptoms keep shifting and are sometimes comorbid with one another.

psychomotor development: an infant's ability to demonstrate the locomotor skills, personal and social functioning, fine motor skills, and language development.

relationship discord: the lack of concord or harmony between the mother of the infant and others which culminates in arguments that escalate to emotional and psychical fights, partner criticisms, belittling of the spouse's opinions, feelings, and or desires.

poverty: distribution of research respondents' relative wealth into quintiles, implying that the lowest 20% were demarcated as poor while the upper 20% were demarcated as rich.

social support: several types of support or help that mothers receive from their spouses, family and/or other community members which can be emotional and/or instrumental.

Chapter 1: Introduction

1.1 Background

Globally, an estimated 450 million people live with mental illness which accounts for 14% of the global disease burden (Kigozi et al., 2016; World Health Organization, 2017). Women are at higher risk of being affected by specific mental disorders such as depression and Generalised Anxiety Disorder (GAD). Furthermore, women are twice more likely to suffer from depression and GAD than men (Marchesi et al., 2016; World Health Organization, 2017); figures related to depression are 5.1% for women compared to 3.6 % for men (World Health Organization, 2017). One of the factors that is responsible for this variation is that women are more likely to present with internalizing symptoms while men on the other hand are likely to present with externalizing symptoms (Albert, 2015).

Maternal mental health disorders significantly affect women during the postpartum period (Tomlinson et al., 2017; Van Heyningen et al., 2016). This period is one of the major life transitions for most women yet it also encompasses high risk for psychopathology increases. Those women who experience mental illness after giving birth may require special attention and consideration because of the mental illness impact which is greatly exacerbated by their childrearing experiences. However, maternal mental illness is not only excebarrated by maternal characteristics but has also been linked to the infant's characteristics. Infants characteristics such as gender, feeding problems, excessive infant crying, and sleeping problems have been associated with maternal depression and GAD (Dennis et al., 2018; Patel, Rodrigues, & DeSouza, 2002; Petzoldt, Wittchen, Einsle, & Martini, 2015). Yet, in some low- and middle-income countries (LMICs) for instance in South Africa, these women are likely to receive little or low priority despite the disorders impacting on maternal functioning (Tomlinson et al., 2017; Van Heyningen et al., 2016).

Most research on postpartum mental health and its effects on infant growth and psychomotor development has been done in high-income countries (HICs) (Badr, Ayvazian, Lameh, & Charafeddine, 2018). It is evident that 90% of these studies on postpartum mental illness have been done in HICs while only 10% have been conducted in the LMICs (Alipour, Lamyian, & Hajizadeh, 2012). Yet maternal mental health problems in LMICs and HICs differ as far as prevalence (Hodin, 2017). HICs have lower prevalence for both postpartum maternal depression and maternal GAD (Anderson, Hatch, Comacchio, & Howard, 2017; Hodin, 2017; Maselko, 2017).

Prevalence for postpartum depression in HICs is lower compared to the prevalence in LMICs (Dennis, Brown, Falah-Hassani, Marini, & Vigod, 2017; Parsons, Young, Rochat, Kringelbach, & Stein, 2012; Reck, Tietz, Muller, Seibold, & Tronick, 2018), while the prevalence of postpartum maternal GAD is also likely to be higher in the LMICs (Dennis, Falah-Hassani, & Shiri, 2017; T. Field, 2018). The disparity in the prevalence for both postpartum maternal depression and maternal GAD in LMICs is attributed to differences in postpartum stage of assessment, the measures and screening tools used and cut off points used (Baron et al., 2016; Parsons et al., 2012). Furthermore, the high prevalence in LMICs are attributed to a number of social determinants such as poverty, marital discord, low autonomy, and social roles (Husain et al., 2006; World Health Organization & Calouste Gulbenkian Foundation, 2014).

Mothers who are depressed or that have AADA or GAD have a difficult time during the postpartum period. They are likely to have less optimal attachment to their babies and will not be sensitive to their infant's needs and cues (Badr et al., 2018). The postpartum period poses a high susceptibility for development of severe mental illness. It has also been asserted that the mothers' functional impairment and psychopathology during the postpartum period

affects not only the mother but it is likely to affect infant and child outcomes (Muzik et al., 2017).

Postpartum maternal depression and maternal GAD not only affect the mother but can also have adverse effects on the psychomotor development of the infant (Conroy et al., 2012). Postpartum depression and GAD may increase the emotional and physical demands on women, which is likely to affect the mother's and infant's psychomotor functioning (Christodoulou, Le Roux, et al., 2019). An infant's psychomotor functioning is affected by the mother's mental health status, quality of care and the environment (Gordon, Usdansky, Wang, & Gluzman, 2011). Infant motor, intellectual, and emotional development is significantly affected by both postpartum maternal depression and maternal GAD (Conroy et al., 2012; Howard & Challacombe, 2018; Keim et al., 2011; Santos, Matijasevich, Barros, & Barros, 2014; A. Stein et al., 2018). Maternal mental illness does not only affect infants' psychomotor development but also affects their physical growth, leading to malnutrition and increased episodes of diarrhoea (Chowdhury & Raut, 2015; Jacques, Loret, Mola, Joseph, & Arndt, 2019; Patel, Rahman, Jacob, & Hughes, 2004).

In LMICs, findings on infant growth and postpartum depression have presented inconsistent results (Kazi, Nazmul, Shirin, Abu, & Meerjady, 2019; Surkan, Kennedy, Hurley, & Black, 2011; Tomlinson, Cooper, Stein, Swartz, & Molteno, 2006). In some LMICs postpartum depression is associated with poor infant growth outcomes and cognitive deficits that impede holistic and successful growth of infants (Kazi et al., 2019; Norhayati, Nik Hazlina, Asrenee, & Wan Emilin, 2015; Patel, Rahman, et al., 2004). Some studies, however, report contradictory results with regard to the association between postpartum depression and infant growth. Studies by Santos, Matijasevich, Domingues, Barros, and Barros (2010) and Tomlinson et al (2006) found that postpartum depression does not affect infant growth

Unfortunately in LMICs, few mothers are diagnosed or treated for postpartum maternal depression, maternal GAD or their comorbidity and this may pose a risk for chronicity (Badr et al., 2018). The consequences of this undiagnosed or misdiagnosed maternal mental illness do not only affect the mother and the infant but the entire family. Not only does this place a substantial socioeconomic weight on the family in terms of low productivity and unemployment but it may also pose a risk of trans generational effects on the infant.

In Uganda very few studies have examined postpartum maternal depression (Cox, 1983; Kakyo, Muliira, Mbalinda, Kizza, & Muliira, 2012; Nakku, Nakasi, & Mirembe, 2006; Singla, Kumbakumba, & Aboud, 2015). Thus far only one study (Singla et al., 2015) has been carried out on postpartum maternal depression and its impact on both infant growth and development in Uganda. There is no study in Uganda that focuses on postpartum maternal GAD and its association with infant growth and psychomotor development. One study that focuses on both postpartum maternal depression and maternal GAD looks at postpartum maternal mental health care (Nakku et al., 2016). Only three studies carried out in Uganda have focused on infant psychomotor functioning (Ainsworth, 1979; Geber & Dean, 1957; Singla et al., 2015). This study aimed at addressing this knowledge gap by studying the impact of postpartum maternal depression and maternal AADA or maternal GAD on infant psychomotor development and growth in rural Uganda.

1.2 Problem Statement

Maternal mental illness (postpartum depression, GAD and their comorbidity) occurs during a critical stage in the infant's life when the mother-infant relationship is important for both physical growth and psychomotor development (Badr et al., 2018; Mekonnen et al., 2018). The first year of life poses a high risk for the infant since it is the time that the infant needs

most care and any inadequacies are likely to affect the infants' physical growth and cognitive development (Ahun & Côté, 2019; Tomlinson et al., 2017). When the mother's mental health is compromised during this critical period of development, infants are likely to become vulnerable as they depend almost entirely on the mother for their social and nutritional needs. This may make them susceptible to the effects of their mothers' mental health status hence affecting the infant's physical growth and cognitive development. It should be noted that the impact of maternal mental illness may have long lasting effects on both mothers and infants. For instance, maternal GAD symptoms are likely to impact the mothers' current functioning as well as their functioning in the subsequent pregnancies (Gold, Boggs, Muzik, & Sen, 2014).

Most studies on postpartum maternal mental health that have been carried out in LMICs have been done in either urban or peri-urban settings such as Kampala, Uganda (Cox, 1983; Kakyo et al., 2012; Nakku et al., 2006), Ibadan and Osogbo, Nigeria (Abiodun, Mapayi, Abiodun, Mosanya, & Adeomi, 2018), Khayelitsha, a peri-urban settlement near Cape Town, South Africa (Hung et al., 2014; Lund et al., 2014; Tomlinson et al., 2006) and Kathmandu (Regmi, Sligl, Carter, Grut, & Seear, 2002). Women who live in urban settings are likely to have better standards of living, compared to those who stay in rural setting. Results from these groups may, therefore, not be representative of women living in the rural areas. Furthermore, rural settings have been found to have higher prevalence and the mother and infant's environments are less likely to be protective (Kakyo et al., 2012; Mollard, Hudson, Ford, & Pullen, 2016; Villegas, Mckay, Dennis, & Ross, 2011).

1.3 Aim

This study aimed at examining the effect of maternal mental illness assessed at six weeks and six months postpartum on the growth and development outcomes of infants in rural Uganda. It also examined whether poverty, marital discord and social support was associated with

postpartum maternal depression, maternal AADA or maternal GAD, infant psychomotor development and growth.

1.4 Objectives

The objectives of the study were:

1. To assess the prevalence of postpartum maternal metal illness (depression, AADA and GAD) in Uganda.
2. To examine whether postpartum maternal depression and postpartum maternal AADA or maternal GAD are associated with infant growth.
3. To assess the association between poverty, marital discord, social support, and infant growth.
4. To examine whether postpartum maternal depression and postpartum maternal GAD are associated with infant psychomotor development.
5. To assess the association between poverty, marital discord, social support, and infant psychomotor development.
6. To validate the EPDS and SRQ-20 as screening tools for maternal mental illness in these contexts.

1.5 Thesis Layout

The thesis is divided into six chapters. The first Chapter is the introduction. This chapter provides background for the research. I introduce the study by discussing the general overview of the existing literature on global mental health and then I focus on maternal mental health, especially depression and anxiety. The statement of the problem, aims of the study, objectives of the research, research questions and the thesis layout are presented next.

In Chapter 2, I review the literature with regard to maternal mental health, infant psychomotor functioning and growth at the global, sub-Saharan Africa and Ugandan levels. The reviewed literature in this chapter is organised into parts, which include the introduction, maternal mental health in the postpartum period, infant growth, psychomotor functioning, psychosocial factors in the postpartum period, and lastly the theoretical points of departure.

The third Chapter is the methods chapter in which I describe the methods that I used in this study. It is sectioned into introduction, research design, study location, participants, measures and instruments, ethical clearance and considerations, data collections and procedure data entry, and lastly data analysis.

Chapter 4 focuses on the results of the study. This chapter is divided into seven sections. The first section is the introduction of the chapter. The second section focuses on the recruitment procedure of participants. The third section focuses on the results from the baseline while the fourth section focuses on the results of the follow-up study point. Furthermore, this chapter also looks at effectiveness of screening tools for depression that were used in this study. The second last section looks at the Multivariable Analysis.
Lastly I present a summary of the baseline and follow up results

Chapter 5 discusses the results in chapter four in line with the reviewed literature. The chapter reflects and discusses the empirical findings of the study, and their contribution to maternal mental health, infant growth and development. The chapter presents a critical evaluation of the prevalence of maternal mental illness in rural Uganda, psychosocial predictors of maternal mental illness in the postpartum period, and the association of maternal mental health, infant growth and infant psychomotor functioning. It also discusses the EPDS and SRQ-20 as screening tools for maternal mental health in rural Uganda. It is concluded with a summary of the entire chapter.

Chapter 6 concludes the thesis. In this chapter I start with an introduction after which the study implications for clinical practice in Uganda and global mental health are presented. The next section is the study's contribution to the new knowledge in the public mental health field. The strengths and limitations of the study are also presented in this chapter and recommendations for intervention and further research. This chapter ends with a conclusion.

Chapter 2: Literature Review

2.1 Introduction

Worldwide, motherhood is regarded as a meaningful and joyous experience by many. However, new mothers are prone to experiencing maternal mental illness that may not only affect them but also the growth and development of their infants. For optimal infant growth and development, an infant needs a rich environment and positive interactions with both his/her parents and the immediate social environment (N. J. Bergman, 2019; Santos Jr et al., 2016; S. Sharma & Nagar, 2009). Maternal mental illness during the postpartum period may not only cause disruption in the infant's growth and development but may also affect relationships. It is not only the mother-infant relationship that is affected but also relationships with the spouse or partner, in-laws friends and other family members. This could also affect the level of social support that is accorded to the mother during this period. Furthermore, if mothers are living in extreme poverty this could exacerbate their situation.

This chapter presents an overview of literature relating to maternal mental illness, infant growth and development. The chapter is divided into nine sections. The chapter begins with the introduction which is followed by a second section that discusses the nature of postpartum maternal depression and maternal GAD. The third section focuses on the prevalence of maternal mental illness in both the HICs and LMICs. The forth section discusses the psychosocial factors (poverty, social support and relationship discord) that are associated with maternal mental illness. This is then followed by the fifth section which focuses on the association between maternal mental illness and infant growth. The sixth section looks at the association between maternal mental illness and infant psychomotor development. The seventh section focuses on the association between infant outcomes (infant growth and infant psychomotor development) and comorbidity of postpartum maternal depression and maternal GAD. The chapter also has a section on the theoretical point of

departure and focuses on the Bronfenbrenner's Bioecological Theory for Human Development. Lastly the chapter ends with a conclusion.

2.2 The Nature of Postpartum Maternal Depression and Maternal GAD

The postpartum period is a period that occurs four weeks after childbirth although some researchers see this as limiting since having a child is a major life adjustment experience which may continue for many months or years after child birth (Ahmed, Bowen, Feng, & Muhajarine, 2019; Beck & Driscoll, 2006; Bina, 2019; Garman, Cois, Tomlinson, Rotheram-Borus, & Lund, 2019; Kendall-Tackett, 2005). During this period mothers may suffer from different mental illnesses such as mood disorders, anxiety and/or psychological distress. Postpartum maternal mood disorders are divided into three pre-existing mental illnesses, namelybaby blues, postpartum depression and the more serious puerperal psychosis (Cox, Holden, & Henshaw, 2014).

2.2.1 Symptoms and Diagnosis of Postpartum Depression

The Diagnostic and Statistical Manual of Mental Disorders IV[1] (DSM IV) and ICD 10 criteria states that postpartum depression lasts from two weeks to one year after giving birth and is different from other postpartum emotional adjustment disorders by the severity, consistence and pattern of symptoms (American Psychiatric Association, 2002; World Health Organization, 1992). MacLean and Pearlstein (2018) concur and define it as a major depressive episode which may occur between two weeks to one year after giving birth. Postpartum depression is more severe than the baby blues that occur in the first two weeks

[1] The DSM-IV-TR diagnostic criteria was used because the items on the SCID-IV which was used as the gold standard in this study were designed based on the DMS IV –TR criterion (First, Gibbon, et al., 2002).

after giving birth. In some cases the mother may experience postpartum depression beyond the stipulated one year period and it extends to three years postpartum and beyond (Ahmed et al., 2019; Bina, 2019; Garman et al., 2019).

Research has shown that postpartum depression clinical presentation is similar to classical clinical depression (Beck & Driscoll, 2006; Brummelte & Galea, 2016; Cox et al., 2014). Within the current classification system, postpartum depression is a classified type of depression. However, a specifier "*with postpartum onset*" which is limited to the first four weeks postpartum was introduce in the DSM IV-TR (American Psychiatric Association, 2002).

Several symptoms of postpartum depression have been highlighted, including headaches, crying, low self-esteem, exhaustion, irritability, palpitations, sleep disturbances, anxiety, appetite issues, thought blocking, mental sluggishness, thoughts of infanticide, suicidal ideation and mental sluggishness (American Psychiatric Association, 2002; Brummelte & Galea, 2016; Cox et al., 2014; Hung et al., 2014). In this study, in line with the studies highlighted above, postpartum depression is defined as an episode of major depression that occurs four or more weeks after giving birth. Furthermore, postpartum depression in this study was diagnosed using the diagnostic criteria for a major depressive disorder in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) (2000) (See Figure 2.1).

Diagnostic criteria for Major Depressive Episode

A. Five (or more) of the following symptoms have been present during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either

(1) Depressed mood or
(2) Loss of interest or pleasure.

Note: Do not include symptoms that are clearly due to a general medical condition, or mood-incongruent delusions or hallucinations.

(1) Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful). Note: In children and adolescents, can be irritable mood.
(2) Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation made by others)
(3) Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. Note: In children, consider failure to make expected weight gains.
(4) Insomnia or Hypersomnia nearly every day
(5) Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down)
(6) Fatigue or loss of energy nearly every day
(7) Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick)
(8) Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others)
(9) Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide

B. The symptoms do not meet criteria for a Mixed Episode.

C. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

D. The symptoms are not due to the direct physiological effects of a substance(e.g., a drug of abuse, a medication) or a general medical condition (e.g., hypothyroidism).

E. The symptoms are not better accounted for by Bereavement, i.e., after the loss of a loved one, the symptoms persist for longer than 2 months or are characterized by marked functional impairment, morbid preoccupation with worthlessness, suicidal ideation, psychotic symptoms, or psychomotor retardation.

Postpartum onset specifier: Onset of episode within 4 weeks postpartum

Figure 2.1 Diagnostic criteria for Major Depressive Episode from The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision. DSM-IV - TR (2000), American Psychiatric Association

2.2.2 Symptoms and Diagnosis of Postpartum Maternal GAD

Occasional experience of anxiety is normal for mothers in the postpartum period. However, feeling extremely worried or nervous about everyday things such as the new born baby, finances, health, and or family problems with little or no substantive reason to worry about

them may be considered abnormal and is referred to as GAD. Women who experience GAD in the postpartum period may find it difficult to control the anxiety or even carry on their daily activities or tasks. A number of women during the postpartum period experience GAD although it is often not recognised or diagnosed. Postpartum maternal GAD is often characterised by excessive worrying which lasts for a period of six month or more and is accompanied by fatigue, sleep disturbances, restlessness, muscles tension, poor concentration, trembling, irritability and sometimes somatic symptoms (American Psychiatric Association, 2002; MacLean & Pearlstein, 2018).

During the postpartum period, it is not uncommon to find that some mothers' worry is often centred around a few areas such as motherhood and the infant thus not meeting the full criteria of GAD even though they may be significantly anxious (Brockington, Macdonald, & Wainscott, 2006). Most women during this time may meet some of the DSM -IV diagnostic criteria for GAD, but not all. For instance some women may have all the symptoms of GAD apart from six months duration and therefore, cannot be diagnosed with GAD but AADA (American Psychiatric Association, 2002; Matthey, Barnett, Howie, & Kavanagh, 2003; Reck et al., 2008; Wenzel, Haugen, Jackson, & Robinson, 2003). Furthermore, women in the postpartum period may experience what is referred to as sub-syndromal GAD which refers to a situation in which the mother meets the DSM-IV-TR diagnostic criteria for the disorder but the symptoms do not cause clinical impairment or significant distress that affects the mother socially, occupationally or does not affect areas of important functioning (E. Ali, 2018).

To diagnose postpartum maternal GAD in this study, the DSM-IV-TR diagnostic criteria for GAD was used (See Figure 2.2). GAD can only be diagnosed with a duration of six months. It was, therefore, impossible for mothers to be diagnosed with GAD at six weeks postpartum (baseline). In this study, mothers who met the entire criteria of GAD, except the duration (six months and above), were then diagnosed with AADA (American Psychiatric

Association, 2002; Matthey et al., 2003; Reck, Noe, Gerstenlauer, & Stehle, 2012; Reck et al., 2008; Wenzel et al., 2003) (see Figure 2.3).

Diagnostic criteria for 300.02 Generalized Anxiety Disorder

A. Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least 6 months, about a number of events or activities (such as work or school performance).

B. The person finds it difficult to control the worry.

C. The anxiety and worry are associated with three (or more) of the following six symptoms (with at least some symptoms present for more days than not for the past 6 months). Note: Only one item is required in children.

(1) Restlessness or feeling keyed up or on edge
(2) Being easily fatigued
(3) Difficulty concentrating or mind going blank
(4) Irritability
(5) Muscle tension
(6) Sleep disturbance (difficulty falling or staying asleep, or restless unsatisfying sleep)

D. The focus of the anxiety and worry is not confined to features of an Axis I disorder, e.g., the anxiety or worry is not about having a Panic Attack (as in Panic Disorder), being embarrassed in public (as in Social Phobia), being contaminated (as in Obsessive-Compulsive Disorder), being away from home or close relatives (as in Separation Anxiety Disorder), gaining weight (as in Anorexia Nervosa), having multiple physical complaints (as in Somatization Disorder), or having a serious illness (as in Hypochondriasis), and the anxiety and worry do not occur exclusively during Posttraumatic Stress Disorder.

E. The anxiety, worry, or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

F. The disturbance is not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition (e.g., hyperthyroidism) and does not occur exclusively during a Mood Disorder, a Psychotic Disorder, or a Pervasive Developmental Disorder.

Figure 2.2 Diagnostic criteria for Generalized Anxiety Disorder from The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision. DSM-IV - TR (2000), American Psychiatric Association.

Diagnostic criteria for Adjustment Disorders

A. The development of emotional or behavioral symptoms in response to an identifiable stressor(s) occurring within 3 months of the onset of the stressor(s).

B. These symptoms or behaviors are clinically significant as evidenced by either of the following:

(1) marked distress that is in excess of what would be expected from exposure to the stressor
(2) Significant impairment in social or occupational (academic) functioning

C. The stress-related disturbance does not meet the criteria for another specific Axis I disorder and is not merely an exacerbation of a pre existing Axis I or Axis II disorder.

D. The symptoms do not represent Bereavement.

E. Once the stressor (or its consequences) has terminated, the symptoms do not persist for more than an additional 6 months.

Specify if:

Acute: if the disturbance lasts less than 6 months
Chronic: if the disturbance lasts for 6 months or longer Adjustment Disorders are coded based on the subtype, which is selected according to the predominant symptoms.

The specific stressor(s) can be specified on Axis IV.

309.0 With Depressed Mood
309.24 With Anxiety
309.28 With Mixed Anxiety and Depressed Mood
309.3 With Disturbance of Conduct
309.4 With Mixed Disturbance of Emotions and Conduct
309.9 Unspecified

Figure 2-3 Diagnostic criteria for Acute Adjustment Disorder with Anxiety (AADA) [309.24] from The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision. DSM-IV - TR (2000), American Psychiatric Association.

2.3 Prevalence of Postpartum Maternal Depression, GAD and their Comorbidity

This section discusses the prevalence of postpartum maternal depression, maternal GAD and their comorbidity. It is divided into four sections. Section 1, focuses on the prevalence of postpartum depression. This is followed by a section that focuses on the prevalence of postpartum maternal GAD, while the third section looks at the prevalence of the comorbidity of postpartum maternal depression and maternal GAD. The fourth and last section focuses on the prevalence of postpartum maternal depression and maternal GAD in Uganda.

2.3.1 Prevalence of Postpartum Maternal Depression

Maternal mental illnesses among women significantly contribute to the global public health burden. The prevalence of postpartum maternal depression among women is projected to be between 5% and 69.9%, although some researchers have asserted that the more reliable approximation is between 8 and 15% (Norhayati et al., 2015; Pope & Pope, 2000; Shorey et al., 2018; Surkan et al., 2011).

In HICs, studies have shown that 0.1% to 69.9% of women experience depression during the postpartum period (Beck, 2001; Norhayati et al., 2015; Posmontier & Horowitz, 2004; Robertson, Celasun, & Stewart, 2003). Average-wise, the prevalence of postpartum depression is higher in LMICs than in HICs. Studies in LMICs show that the prevalences for postpartum depression range from 1% to 82.1% after giving birth (Affonso, De, Horowitz, & Mayberry, 2000; Anokye, Acheampong, Budu-Ainooson, Obeng, & Akwasi, 2018; Chandran, Tharyan, Muliyil, & Sulochana, 2002; Moraes et al., 2006; Norhayati et al., 2015; Parsons et al., 2012; Rahman, Iqbal, Bunn, Lovel, & Harrington, 2004; Sawyer, Ayers, & Smith, 2010; R. C. Stewart et al., 2010; Tomlinson et al., 2006).

Overall we note that even with the above differences in prevalence, a comparison between HICs and LMICs shows that LMICs have higher postpartum depression rates (Parsons et al., 2012). Furthermore, while some countries in the LMICs have reported higher prevalences, others have reported prevalences similar to HICs. The variations in the prevalences for postpartum maternal depression, maternal GAD and their comorbidity in both HICs and LMICs is attributed to a number of factors as highlighted below.

The wide variation of the prevalences depend on factors such as the methods and criteria used to identify the mothers, the timing of the assessment; Some researches are conducted at birth while others are done at different time points up to two years postpartum, and the confounding variables at play during the postpartum period, the differing measures of

depression and factors associated to these measures such as cut off points (Azale, Fekadu, & Hanlon, 2018). These variations or heterogeneity in the prevalence within and across countries can be partly related to the difference in assessment tools, postpartum stage at which the study is carried out or the timing of the assessment during the postpartum period, different cut off scores for the different scales that are used in different studies, the type of sample recruited (community, or hospital based), the definitions of the disorders that are used in the different studies, and the severity of the disorders.

There are a number of screening tools or self-report tools used to measure depression in the postpartum period. These may include, but are not limited to, the Edinburgh PND Scale (EPDS), the World Health Organization (WHO) Self-Reporting Questionnaire (SRQ), Zung's Self-Rating Depression Scale, Beck Depression Inventory (BDI), the Centre for Epidemiological Studies Depression Scale (CES-D), the Kessler scales, the Hamilton Depression Rating Scale, and the Revised Clinical Interview Schedule (CIS-R). The EPDS has been validated for different settings and is one of the most commonly used postpartum screening tool. Other studies have used structured psychiatric interviews such as the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV Axis I Disorder (SCID) and the Mini International Neuropsychiatric Interview. Screening tools are likely to give higher prevalences compared to diagnostic interviews. Although even within the screening tools some give higher prevalence than others, for instance the CES-D compared to the EPDS (Parsons et al., 2012).

It is important to note that the time of assessment in the various studies differs, making it difficult to make comparisons. In some studies, the assessment is done over two weeks while other studies have gone beyond one year. While some studies have found that depressive symptoms decrease over time others studies have stated that the prevalences remain stable over time or prevalence have increased as time elapse.

2.3.2 Prevalence of Postpartum Maternal GAD

There is a paucity of literature in both HICs and LMICs on the prevalence of postpartum GAD in the postpartum period. Few studies have focused on GAD during the postpartum period, yet it would be logicalthat women are more vulnerable to the development of GAD. This period is coupled by overwhelming multiple roles, poor nutrition, demands, financial difficulties and probably sleep disruption (Thorsness, Watson, & Larusso, 2018; Wenzel, Haugen, Jackson, & Brendle, 2005). In the HICs, findings show that the prevalences of postpartum maternal GAD range from 8% to 40.4% (Bener, Gerber, & Sheikh, 2012; Dennis, Coghlan, & Vigod, 2013; Downs, Schaefer, Beiler, & Weisman, 2013; Fairbrother, Janssen, Antony, Tucker, & Young, 2016; Fairbrother, Young, Janssen, Antony, & Tucker, 2015; Matthey et al., 2003; R. L. Miller, Pallant, & Negri, 2006; Reck et al., 2008; Shlomi Polachek, Harari, Baum, & Strous, 2014; Wenzel et al., 2003, 2005). The few available studies from LMICs show postpartum maternal GAD prevalences ranging from 14% to 28% (Adewuya & Afolabi, 2005; Barthel et al., 2016; Niloufer, Badar, & Iqbal, 2009; Sawyer et al., 2010).

These prevalences are associated with a number of factors which may include the following: stress during pregnancy, food insecurity, negative child birth experiences, infant hospital admissions, poverty, relationship discord, history of mental illness and other stressful life events (Falah-hassani, Shiri, & Dennis, 2016; Van Heyningen et al., 2017). Mothers with GAD exhibit a considerable degree of impairment and disability which affects their productivity and their health care services usage may increase (MacLean & Pearlstein, 2018). The implications for maternal GAD prevalence are not only for the mother but may also affect the infant. Mothers with GAD are more likely to have children who are insecurely attached and behaviourally inhibited (Dennis, Falah-Hassani, et al., 2017; Fairbrother et al., 2016). This could be due to that fact that mothers who have GAD are likely to have negative

mood, impaired adaptability and find it hard to interact and sooth their infants (Fairbrother et al., 2016). With the reported prevalences of maternal GAD and its consequences on both the mother and the infant, it is therefore important that there should be mandatory screening and diagnosis for maternal GAD and those affected should be offered treatment.

2.3.3 Prevalence of Comorbidity of Postpartum Maternal Depression and Maternal GAD

In the HICs the prevalence of Comorbidity of Postpartum maternal Depression and maternal GAD ranges between 2% and 75% (Austin et al., 2010; Enatescu et al., 2014; Falah-hassani et al., 2016; Giakoumaki, Vasilaki, Lili, Skouroliakou, & Liosis, 2009; E. S. Miller, Hoxha, Wisner, & Gossett, 2015; Rados, Tadinac, & Herman, 2018; Reck et al., 2012, 2008; Ross, Evans, Sellers, & Romach, 2003; Shlomi Polachek et al., 2014; Tavares et al., 2012; Wenzel et al., 2005; Wisner et al., 2013; Yelland, Sutherland, & Brown, 2010). In LMICs, however, very few studies have been conducted about the comorbidity of postpartum maternal depression and maternal GAD. Studies conducted found a prevalence range of 3.4% to 7.2% (Adewuya & Afolabi, 2005; Edhborg, Nasreen, & Kabir, 2011). More studies have been carried out in HICs than LMICs. Interestingly by average, LMICs have a lower prevalence of comorbidity between maternal depression and maternal GAD than the HICs. However, this prevalence of comorbidity between depression and GAD suggests that a great number of women experience both disorders in the postpartum period (Falah-hassani et al., 2016).

The comorbidity of maternal depression and maternal GAD in the postpartum period is likely to be prevalent among mothers during the postpartum period although little is known about the risk factors that are associated with it (Rados et al., 2018; Reck et al., 2012). This is because of the assumption that the symptomatology of GAD that the women exhibit are considered to be masked depression (Giakoumaki et al., 2009). The high prevalence of

comorbid postpartum maternal depression and maternal GAD may be affected by several risk factors compared to the singular presentation of either depression or anxiety disorders. Some of the risk factors that are associated with comorbid maternal depression and maternal GAD include lack of social support, maternal self-esteem, poverty, not living in a suitable house, breastfeeding, self- efficacy ethnicity (Falah-hassani et al., 2016). Therefore, given the high prevalence and risk factors associated with postpartum comorbid maternal depressive and maternal GAD symptomatology, more research is needed in order for reliable strategies that can identify women suffering from it and to also identify effective treatment and intervention options.

2.3.4 Prevalence of Postpartum Maternal Depression and Maternal GAD in Uganda

Very few studies have been carried out about the prevalence of postpartum maternal depression and maternal GAD in Uganda. Yet, about 1.7 million (4.6%) people live with depressive disorders while 1.07 million (2.8%) live with anxiety disorders (Kaketo, 2017). The few studies have found a prevalences for postpartum depression ranging between 6.1% and 43% (Cox, 1983; Kakyo et al., 2012; Nakku et al., 2006; Singla et al., 2015). A number of factors account for the variations in the reported prevalence; one could be the difference in setting of the study; of the three studies, two were conducted in a peri- urban setting while one was conducted in a rural setting. These studies also have different population characteristics and sample sizes. Furthermore, two out of the three studies used screening tools while only one used a psychiatric interview to diagnose depression.

There is a paucity of studies that report the prevalence of postpartum maternal GAD in Uganda. Cox (1983) reported a prevalence of 3.4% and asserted that often maternal GAD is reported higher in the prenatal period than in the postpartum period because successful delivery of the baby is associated with reduction of maternal GAD in the postpartum period.

To the best of my knowledge no studies have been carried out in Uganda on comorbidity of postpartum maternal depression and maternal GAD.

2.4 Psychosocial Factors and Maternal Mental Illness in the Postpartum Period

This section focuses on psychosocial factors and their association to maternal mental illness in the postpartum period. It starts by reviewing literature on poverty and maternal mental illness. The second section specifically focuses on the association between social support and maternal mental illness. The third section focuses on relationship discord and maternal mental illness during the postpartum period.

2.4.1 Poverty and Maternal Mental Illness

There is an association between maternal mental illness and poverty (Lund et al., 2010, 2018). For example, findings show that depressed women in the postpartum period are more likely to have low income, to be less educated and may not be employed (Rotheram-Fuller et al., 2018). In a systematic review about poverty and maternal mental illness in LMICs results show an association between poverty and maternal mental illness observed in 79% of the multivariate analyses studies, while 73% was found in studies using bivariate analysis (Lund et al., 2010). Worrying about finances in the postpartum period causes stress to the mother about basics like food, medical care and limited access to community resources which may trigger off the likelihood of suffering from either depression or GAD or their comorbidity. In HICs women from the lowest quintile compared to the other quintile experienced higher rates of maternal mental illness in the postpartum period.

The direction and mechanism behind that association of poverty and maternal mental illness are bidirectional in nature and are best explained by both social causation and social drift perspectives(Dohrenwend, 1993; Dohrenwend et al., 1992; Ritsher, Warner, Johnson, & Dohrenwend, 2001). The social causation perspective hypothesises that factors such as poor

physical health, stigmatisation, lack of access to health care stress and negative life events surrounding the mental illness which operate with poverty may exacerbate and maintain maternal mental illness (Dohrenwend, 1993; Lund et al., 2010, 2018; Lund & Cois, 2018). On the other hand, the social drift perspective asserts that mothers who are mentally ill are likely to be poor because of reduction in income, lack of employment, and the experience of job dismissals (Dohrenwend, 1993; Lund et al., 2010, 2018; Lund & Cois, 2018). More research is therefore required in order to understand these mechanisms and directionality of the association between poverty and maternal mental illness.

While poverty in and of its self may not be a risk factor, in combination with other variables, it could trigger maternal mental illness. Poverty operates in environments where other predictors are present. When poverty combines with other stressors such as low education, low social support and relationship discord it has been clearly highly correlated with maternal mental illness (Patel, 2014). On the other hand high levels of social support may act as a protective factor against the association between maternal mental illness and poverty. While poverty is a strong predictor of maternal mental illness, especially depression, there is evidence that if the mother has a good social support system, the social support system will act as a buffer against the mental illness (Fisher, Tran, Kriitmaa, & Tran, 2010).

Poverty does not only affect the mother after child birth but may also affect the new born infant. There is evidence that adversity caused by poverty moderates the association between maternal mental illness and infant outcomes (infant growth and development) (Pearson et al., 2013; Tomlinson, Bornstein, Marlow, & Swartz, 2015; World Health Organization, 2009). Poor infant outcomes are more likely to be associated with mothers living in difficult socioeconomic circumstances. Poverty is associated with family stress and maternal depression which also affects the mother's ability to look after and stimulate the infant's psychomotor functioning (Tomlinson, 2015; Tomlinson & Morgan, 2015).

Furthermore, child development and mental health are clearly affected by poverty or economic deprivation and interventions that target poverty have both behavioural and developmental benefits (Lund, 2018). More research in this area is, however, needed to establish how to break the negative cycle that is associated with maternal mental illness and poverty and their adverse effects on infant and child outcomes.

2.4.2 Social Support and Maternal Mental Illness

Internationally, there is an overall agreement that social support during the postpartum period strongly influences maternal mental illness in the postpartum period. Social support is important in stressful periods and is strongly associated with women's mental health during the postpartum period. Women who have at least one person other than their spouse to confide in during the postpartum period are less likely to suffer from maternal mental illnesses like depression and GAD (Beck & Driscoll, 2006; Brockington, 2004; Garman et al., 2019; Kendall-Tackett, 2005). Support from others is a protective factor of postpartum depression (Husain et al., 2006; Patel, Rahman, et al., 2004; Rashid & Mohd, 2017; Reid & Taylor, 2015).

Several studies have shown that in many countries it has been found that familial support is a more protective factor for PND than material support (Fisher et al., 2010; Martini et al., 2017; Xie, He, Koszycki, Walker, & Wen, 2009). Family support during this period that does not undermine the mother's feelings and makes her comfortable is received as useful to the mother. Furthermore, lack of familial support is a stronger predictor of maternal mental illness than the lack of material support. Therefore, it is important for familial support to be strengthened or for a mother to have a confidant that she trusts after child birth.

Women who have given birth in Uganda have a strong social support system which is embedded with the extended family, neighbours and friends (Bantebya, 2009; Byaruhanga et

al., 2011; Mbonye et al., 2012). This social support system in the postpartum period may protect the new mother from psychiatric disorders such as depression, GAD and psychological distress (Cox, 1999). The social support system could either include the father of the infant, grandmothers, mother of the woman, mother-in-law, friends or the immediate neighbours (Kirkwood, Neeloy, & Sharmin, 2008; Mbekenga, Pembe, Darj, Christensson, & Olsson, 2013). Often in rural Uganda, it is this social support system that takes over the mother's role in looking after the infant, especially during the first three months. During the first three months after delivery other caregivers or stakeholders such as the mother of the nursing woman or her mother-in-law, maid or female relative in the homestead take over the role of nursing both the mother and their infant (Byaruhanga et al., 2011; Mbonye et al., 2012). Some women may go back to their mother's homes for months after childbirth. This time is used to help the mother of the child to cope with the new changes in her life, learn more practical skills of looking after the baby, and also engage her in the different rituals during this period.

However, while social support is very important during the postpartum period, it can also be detrimental and result in even more episodes of maternal mental illness. Conflicts with people offering social support, especially in-laws, are strong predictors of maternal mental illness, for instance depression and anxiety (Deng, Xiong, Jiang, Luo, & Chen, 2014; Fisher et al., 2010; Heh, Coombes, & Bartlett, 2004; Madlala, 2018; Xie et al., 2009). As much as family ties are helpful during the postpartum period they can pose challenges when they are a source of tension. These mothers may feel lonely or emotionally and socially isolated.

This support and help given to the mother during the postpartum period may help the mother cope and get used to the new role of motherhood and further buffer the onset of mental illness and may also reduce the effects of maternal mental illness on the infant.

Furthermore, this social support during the postpartum period has been found to reduce the susceptibility to maternal mental illness, especially depression (Nakku et al., 2006).

Although there is a relatively good understanding of this association, more comprehensive conceptualisation needs to be established about the association between social support, postpartum maternal depression, postpartum maternal GAD, infant psychomotor development and infant growth. There is a need to not only focus on spousal and familial social support but also for greater community cohesion and national and international governance structures that protect people with mental health difficulties, especially in the postpartum period (Tomlinson & Lund, 2012).

2.4.3 Relationship Discord and Maternal Mental Illness

Relationship discord is globally recognised as some of the most powerful predictors of maternal mental illness (Adu, Brown, Asaolu, & Sanderson, 2019; Davis, Rotheram-Borus, Weichle, Rezai, & Tomlinson, 2017; Rotheram-Fuller et al., 2018; Tsai, Tomlinson, Comulada, & Rotheram-Borus, 2016b). There is substantial evidence of the link between relationship discord and postpartum depression. A strong association has been found between relationship discord during pregnancy and postpartum relationship discord (Zlotnick, Capezza, & Parker, 2011). In other words men who perpetrate violence and relationship discord during the perinatal period will most likely continue with the same in the postpartum period. In a nationally representative population based study in Uganda more than half of the married women reported to have experienced relationship discord (Speizer, 2010). These findings are not too different from a study carried out in Vietnam which found that the risk of maternal mental illness was twice as high among women who experienced relationship discord (Fisher et al., 2010). In LMICs mothers with healthy, nurturing and supportive intimate relationships are less susceptible to mental illness compared to those who are living

in antagonistic and un healthy relationships (Chandran et al., 2002; Gibbs et al., 2017; Tsai et al., 2016b).

Alarmingly, high rates of relationship discord and intimate partner violence have been reported to be highest during childbearing years among women. Furthermore, it has been found that relationship discord during the antenatal period is strongly related to relationship discord in the postpartum period (Zlotnick et al., 2011). During the postpartum period there are a number of cited factors that may contribute to relationship discord. Factors such as lack of support from the husband during the postpartum period; perceived partner having other female sexual partners; partner not providing for financially; poor relationship with in laws; alcohol or drug abuse partner inability to provide for the home; controlling partners; partner having another woman; and partner not assisting with household chores may antagonise the relationship between the mother of the infant and their partner or spouse escalating relationship discord (Beydoun, Al-Sahab, Beydoun, & Tamim, 2010; Gold, Spangenberg, Wobil, & Schwenk, 2013; Kakyo et al., 2012; Kornfeld, Bair-Merritt, Frosch, & Solomon, 2012; Lewinsohn et al., 2018; Reichenheim, Moraes, Lopes, & Lobato, 2014).

Furthermore, relationship discord is not only associated with maternal mental illness but could also have an impact on the infants. It should be noted that such spousal behaviour is often harmful and may affect the mental health of women and the infant during the postpartum period. Women who experience relationship discord are more likely to have mixed feelings towards the infant and are likely to breast feed less and for a shorter period compare to their counterparts who are not experience relationship discord (Chung, Mccollum, Elo, Lee, & Culhane, 2004; Tsai et al., 2016b).

The research so far conducted on relationship discord lays a solid foundation for more research to be carried out in order to explore the role of relationship discord at the onset and during the course of maternal mental illness after childbirth. Since not all individuals who are

in relationships that are discordant exhibit mental illness there is a need to find and identify variables that moderate the associations between maternal mental illness and relationship discord. Variables such as age , marital status, social support, poverty, personality characteristic, childhood experiences, and parental depression should be examined to see if they moderate this association, especially in the LMICs (Whisman, 2013). Additional research should be carried out about the interaction between factors that operate within and outside of the intimate relationship and their association with maternal mental illness in the postpartum period.

Although there is a lot of research on the association of relationship discord and maternal mental illness during the postpartum period the above studies are limited by a number of factors. First, most of this research is based in the urban setting and not in the rural areas. Very little known about how relationship discord as a risk factor for maternal mental illness may differ among women from rural or urban setting especially during the postpartum period. Secondly the majority of the above studies have used cross sectional study designs rather than longitudinal study designs. Furthermore many of these studies are not community based studies so they are likely to either underreport or overestimate the occurrence of relationship discord.

2.5 Maternal Mental Illness and Infant Growth

In Uganda, infant and childhood undernutrition, especially stunting and wasting, are more common in rural areas (Kabahenda, Andress, Nickols, Kabonesa, & Mullis, 2014). There are diverse factors that are associated with poor infant growth, especially in Uganda. Factors that may affect wasting include poor maternal health education, socioeconomic factors, dietary factors, lack of milk consumption and lack of personal hygiene (Akombi et al., 2017; Kabahenda et al., 2014; Mawa & Lawoko, 2018; Mokori, Schonfeldt, & Hendriks, 2017).

Stunting, on the other hand, is associated with age of the child, consumption of food with low energy density, consumption of small meals, levels of poverty in the family, poor education of mothers of infants, poor health and prolonged breastfeeding (Akombi et al., 2017; Mawa & Lawoko, 2018; Mokori et al., 2017). It should also be noted that in most communities, however, the birth weights and heights for the infants are not recorded. This is due to a number of factors such as lack of weighing scales in health facilities and mothers giving birth at home. It should be noted that no study has been conducted in Uganda to research the relationship between infant growth and maternal mental illness.

2.5.1 Postpartum Depression and Infant Growth

In LMICs, the few studies carried out on infant growth and postpartum depression have presented inconsistent results (Surkan et al., 2011). Some studies in LMICs have found that postpartum depression is associated with poor infant growth outcomes (Adewuya, Ola, Aloba, Mapayi, & Okeniyi, 2008; Anoop, Saravanan, Joseph, Cherian, & Jacob, 2004; Black, Baqui, Zaman, El Arifeen, & Black, 2009; Choi et al., 2017; Christodoulou, Le Roux, et al., 2019; Harpham, Huttly, De Silva, & Abramsky, 2005; Holm-Larsen et al., 2018; Kazi et al., 2019; Patel, Rahman, et al., 2004; R. C. Stewart et al., 2008). Other studies, however, in both the HICs (Drewett, Blair, Emmett, Emond, & the ALSPAC Study Team, 2004; Dunne, Sneddon, Iwaniec, & Stewart, 2007; Grote et al., 2010) and LMICs (Adewuya et al., 2008; Baker-Henningham, Powell, Walker, & Grantham-McGregor, 2003; Christodoulou, Le Roux, et al., 2019; Harpham et al., 2005; Santos et al., 2010; Tomlinson et al., 2006) report contradictory results when it comes to the impact of postpartum depression on infant growth.

In studies that have found an association it is difficult to substantiate the direct causation between postpartum depression and infant growth because, apart from postpartum depression, infant growth has so many other potentially confounding factors (Fisher, Morrow,

Ngoc, & Hoang, 2004; Garman et al., 2019; Patel, Rahman, et al., 2004). Some of the factors that are confounded with infant growth include differences in breastfeeding practices, food insecurity, postpartum depression and parenting behaviour or non-responsiveness, home environment, maternal education level and family income, maternal parity, low birth weight and preterm births (Anoop et al., 2004; Black et al., 2009; Santos et al., 2014).

Even with the studies that found an association between postpartum depression and infant growth it is not clear how exactly maternal depression impacts on infant growth (Surkan et al., 2011). Some studies have argued that infant growth depends heavily on the primary caregivers who provide social and nutritional needs, and when these caregivers experience mental health problems, children are at high risk of poor growth (Surkan et al., 2011). Furthermore, postpartum depression may impact the mother's provision of adequate nutritional care, which in turn may affect infant growth (Ijumba et al., 2016; Rahman, Lovel, Iqbal, & Harrington, 2004; R. C. Stewart et al., 2008). It can be assumed that mothers with postpartum depression may lack the emotional ability to give attention to proper hygiene, breastfeeding, childcare, or be unable to give nutritional supplements after weaning compared to mothers who are not depressed (Adewuya et al., 2008; Ijumba et al., 2016). It has also been asserted that infant growth is likely to be more affected among mothers who are chronically depressed (Garman et al., 2019; Santos et al., 2010).

Although all the above studies have contributed to narrowing the knowledge gap about postpartum depression and infant growth, the contradictory nature of the findings warrants the need for further research on postpartum depression and how it affects growth of infants.

2.5.2 Postpartum Maternal GAD and Infant Growth

Postpartum GAD is one of the most under studied, undiagnosed and untreated complications of the postpartum period (Fallon, Christian, Halford, Bennett, & Harrold, 2018). There is therefore, a paucity of literature as far as the association between maternal GAD and infant growth is concerned. This could be due to the fact that the focus is usually put on the relationship between maternal depression and infant growth. Most studies have focused on maternal depression with the assumption that maternal GAD is a usual part of depression. Yet postpartum maternal GAD may be associated with numerous suboptimal infant outcomes (Glasheen, Richardson, & Fabio, 2010). Postpartum maternal GAD has profound independent effects just as postpartum depression has profound independent effects on both the women and their infants, especially young women. Furthermore, postpartum anxiety was significantly associated with infant growth (O'Brien, Heycock, Hanna, Jones, & Cox, 2004; Pawluski, Lonstein, & Fleming, 2017). Women who are young are more prone to suffering from GAD disorders than older women (Adewuya, Ola, Aloba, Dada, & Fasoto, 2006; Sawyer et al., 2010).

A number of factors may be at play as far as the association between postpartum maternal GAD and infant growth is concerned. These factors related to both infant growth and maternal GAD may include both child and maternal factors. Infant factors may include oromotor dysfunction, low appetite of the infant, while maternal factors may include how the parents responds to food refusal, poor maternal feeding trends and maternal GAD (Petzoldt et al., 2015; Wright, Parkinson, & Drewett, 2006a). Furthermore, infant feeding difficulties were predicted by maternal GAD, especially among primiparous women and low birth weight infants (Petzoldt et al., 2015).

Even in studies that have found an association between maternal GAD and infant growth the direction of this relationship may not be clear because the difficulties that mothers

may experience due to infant growth may also lead to maternal GAD, low self-efficacy and feelings of helplessness (Dunne et al., 2007; Iwaniec, 2017). Poor feeding performance by the infant may result in maternal GAD which may hence affect the management of feeding the infant (Iwaniec, 2017).

Maternal postpartum anxiety is significantly associated with reduced breastfeeding practices at seven weeks and six months postpartum (Galler, Harrison, Ramsey, Forde, & Butler, 2000; Pawluski et al., 2017). Furthermore, maternal anxiety in the postpartum period is associated with forceful, restrictive and uninvolved breastfeeding styles (Hurley, Black, Papas, & Caufield, 2008; Pawluski et al., 2017). This reduced or restrictive breastfeeding could directly impact on the infant's weight, height and body mass.

Postpartum maternal GAD is also associated with maternal impaired feeding interactions, mothers being insensitive to infants hunger cues, and mothers being indifferent to current feeding recommendations (Fallon et al., 2018; Hughes, Power, Orlet, Mueller, & Nicklas, 2005; Hurley et al., 2008). Fallon et al. (2018) found postpartum maternal GAD to be significantly associated with maternal negative perceptions towards infant feeding behaviour. A systematic review on postpartum maternal GAD and infant-feeding outcomes also showed women with postpartum maternal GAD may not breastfeed exclusively, and will terminate breastfeeding much earlier which significantly impacts infant growth (Fallon et al., 2016).

Another factor that is related to infant growth and GAD is food security. Food insecurity, especially in the LMICs, is strongly associated with maternal mental illness (Dewing, Tomlinson, Ingrid, Chopra, & Tsai, 2013; Lund et al., 2018; Patel et al., 2018; Tsai, Tomlinson, Comulada, & Rotheram-Borus, 2016a). It has also been argued that not only does food insecurity affect the mother but it can also be associated with infants outcomes (Lund et al., 2018). Mothers who have inconsistent access to sufficient food are likely to be anxious

which may affect their ability to feed their infants (Black et al., 2009). Maternal GAD in the postpartum period may be to linked to insufficient food intake, uncertainty of food availability, and insufficient quality of intake all which may affect both the mother and the infant (Nguyen et al., 2013). Mothers who experience maternal mental illness after giving birth are likely to be less attentive to maintenance of personal hygiene, food preparation, food handling for their infant, all of which could increase risks of diarrhoea hence affecting infant growth (Kazi et al., 2019).

Apart from food insecurity, another factor that could moderate the association between maternal GAD and infant growth is chronicity of maternal GAD. It has been reported that chronicity of maternal GAD and severity of symptoms is more prevalent among women (Jalnapurkar, Allen, & Pigott, 2018) yet they are the immediate primary care takers of the infant. Chronic maternal GAD may cause the mother to withdraw from her infant and she may fail to be attentive to both the infants psychological and physical needs and may affect the mother's ability to monitor the infants feeding patterns (World Health Organization, 2004).

2.6 Maternal Mental Illness and Infant Psychomotor Functioning

In Uganda, only three studies were found to be related to infant psychomotor development. Using the Gesell Development Schedules in the first study, precocious development was found among 252 infants, with locomotor development found to be the most fast-tracked compared to comprehension and language, fine motor skills and personal social development (Geber & Dean, 1957). The second study used the Griffith Infant Intelligence Scale on a sample size of 28 infants and found similar results to the first study (Ainsworth, 1979). The third study, cognitive and receptive language development, were measured with the Bayley Scales of Infant Development, 3rd Edition and maternal depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale (Singla et al., 2015). No studies

have been conducted in Uganda with specific focus on the association between maternal mental illness and infant psychomotor development. This section is divided into two sections. The first section focuses on the association between maternal postpartum depression and infant psychomotor functioning while the second section focuses on the association between postpartum maternal GAD and infant development.

2.6.1 Postpartum Depression and Infant Psychomotor Functioning

Regardless of culture and language infants need environments that are physically supportive and stimulating for their brain development. The infant's brain development and neural connections are formed during the first 1,000 days after birth and are central to the infant's cognitive, emotional and social development (Tomlinson, 2015). Lack of such environments in the infant's homesteads may contribute to long term developmental delays such as cognitive, behavioural, language and social (Maggi, Irwin, Siddiqi, & Hertzman, 2010). The mother of the infant is the main source of development cues such as emotional stimulation, language learning, affect, sleep and feeding patterns. These developmental cues can be disrupted and affected if the mother is withdrawn and disengaged (Flykt, Kanninen, Sinkkonen, & Punamäki, 2010).

It has been asserted that postpartum depression has deleterious effects on how the mothers interact with their infants. Often mother may experience ambivalent feelings towards their infant, have low energy, and may be overwhelmed, which affects their ability to initiate interactions with their child which are nurturing in nature(Hanley, 2009; Paris, Bolton, & Weinberg, 2009; Patel, Rahman, et al., 2004). Postpartum depression is associated with maternal competence and mood which may also affect the development of the infant. Postpartum depression, disrupting mother-infant interaction, has long term effects on the infant's development (Foss, Andjukenda, & Hendrickson, 2001; Gelaye, Rondon, Araya, &

Williams, 2016; Maria et al., 2017; Martini et al., 2017; Murray & Copper, 1997; Punamäki, 2018; Singla et al., 2015; Tomlinson & Morgan, 2015).

Postpartum depression often makes mothers perceive their infants as problematic to look after which affects the way they interact with them. Research indicates that mothers with postpartum depression experience inability to love their infants, overwhelming responsibility to take care of the infant, extreme fatigue, irritability, especially towards the infant's crying (Beck & Driscoll, 2006; Patel et al., 2002; Petzoldt et al., 2015). Infants of mothers who are experiencing postpartum depression and are more irritable are reported to have significantly lower or poorer scores on cognitive tests than their counterparts (Beck & Driscoll, 2006; Keim et al., 2011; Kingston, Mcdonald, Austin, & Tough, 2015). Furthermore, infants whose mothers are depressed are likely to have more behavioural deficits. These infants are likely to display lower verbal, motor and perceptual abilities (Beck & Driscoll, 2006; Hay et al., 2001; Mirhosseini et al., 2015). Not only does postpartum depression only affect infants but it has also been found that it affects children in later years. Infants of depressed mothers are likely to perform more poorly in literacy, mathematical development , communication language , personal , social and emotional development (Mensah & Kiernan, 2009; Tran et al., 2014).

However, some studies have argued that there is no association between maternal postpartum depression and infant development (Christodoulou, Stokes, et al., 2019; Cornish et al., 2005; Le Treut, Poinso, Grandgeorge, Dugnat, & Sparrow, 2017; Mekonnen et al., 2018; Piteo, Yelland, & Makrides, 2012; Servili et al., 2010). However, these studies highlight the fact that there are a number of factors that could contribute to infant development. Factors such as rural environment being protective, home environment, persistent poverty, maternal caregiving practices and parenting style, levels of family dysfunction and study methodological differences that contribute to the differences in findings about maternal postpartum depression and infant development (Ahun & Côté, 2019;

Christodoulou, Le Roux, et al., 2019; Cornish et al., 2005; Petterson & Albers, 2001; Piteo et al., 2012; Tran et al., 2014). A study focusing on synchronising and controlling for these factors should be conducted.

Furthermore these diverse results on the impacts of postpartum mental illness on infant psychomotor development suggest a need for further studies to attain a better understanding of why the differences occur. There is also a need to understand how exposure or chronicity of maternal mental illness is more likely to affect infant psychomotor development than a single episode (Garman et al., 2019; Mirhosseini et al., 2015; Servili et al., 2010). Chronic postpartum depression is a clear risk factor for children's cognitive and behavioural development (Hay et al., 2001; Mirhosseini et al., 2015). For instance, maternal depression that persists from pregnancy throughout the puerperium period has been found to be a predictor of the mother's psychological state and infant outcomes (Flykt et al., 2010; Grant, McMahon, & Austin, 2008; Koutra et al., 2013; Rahman & Creed, 2007; R. C. Stewart et al., 2008). This is affirmed by a study in the USA that surveyed 7,677 child-mother dyads and found that chronic postpartum depression had severe effects on infant psychomotor development (Petterson & Albers, 2001). Furthermore, evidence from Australia has shown that an infant's cognitive, language or motor development problem becomes more pronounced in chronic, rather than brief, maternal postpartum depression (Cornish et al., 2005; Piteo et al., 2012). It is asserted that it's not the timing but rather the chronicity of postpartum depression that is important for the quality of mother infant interaction (Flykt et al., 2010). Chronic depression may lead to disruption of maternal care and provides a less intellectually stimulating atmosphere in the home (Ahun & Côté, 2019; Hay et al., 2001). Chronically depressed mothers were found to be less sensitive as far as interacting with their children was concerned, thereby affecting children's attachment security process (Ierardi, Ferro, Trovato, Tambelli, & Riva Crugnola, 2019; Wachs, Black, & Engle, 2009).

2.6.2 Postpartum Maternal GAD and Infant Psychomotor Functioning

A number of studies have been conducted about the impact of maternal depression on infant psychomotor functioning (N. S. Ali, Mahmud, Khan, & Ali, 2013; Bhang et al., 2016; Cornish et al., 2005; Grace, Evindar, & Stewart, 2003; Peyre et al., 2019; Sohr-Preston & Scaramella, 2006) in comparison to maternal GAD. There is a paucity of studies that have examined the association between maternal GAD disorders in the postpartum period and infant psychomotor functioning. N. S. Ali, Mahmud, Khan, and Ali (2013) found that postpartum anxiety was associated with fine motor, gross motor, language, socio emotional, and cognitive development. Coplan, O'Neil, and Arbeau (2005) found an association between maternal GAD and infant activity level, while (Reck, Van Den Bergh, et al., 2018) found that there was an association between maternal GAD and language development. Maternal GAD has been found to be associated with gross motor skills (Keim et al., 2011), cognitive skills (Galler, Ramsey, et al., 2004; Glasheen et al., 2010; Keim et al., 2011), emotional tone of the infant (Nicol-Harper, Harvey, & Stein, 2007), and personal social development (Galler, Harrison, Ramsey, Butler, & Forde, 2004; Galler et al., 2000).

The above findings may be inconsistent because maternal GAD does not operate alone in affecting infant development. Maternal GAD may operate with factors such as mother infant interaction, sleep patterns, and bonding of the infant. Anxious mothers may not be in position to provide stimulus that are both beneficial and age appropriate in order for the infants to have an excellent head start in development (Gewirtz, 2017; Lamb, Bornstein, & Teti, 2002; Santos Jr et al., 2016). The concept of mother infant interaction is very important as far as social learning is concerned, since the mother of the infant is usually the primary caregiver who usually guides and directs the infants. Although there are few studies on maternal postpartum GAD and mother-infant interaction, some have found that the maternal postpartum GAD is a stronger predictor of poor mother-infant interaction patterns

(Creswell, Apetroaia, Murray, & Cooper, 2013; Reck et al., 2012; Riva Crugnola et al., 2016).

Other factors that are associated with maternal GAD, such as maternal avoidance, anxiety cognitions and non-interactive behaviour may prevent the mother from interacting effectively with their infant hence affecting infant psychomotor functioning (Reck, Van Den Bergh, et al., 2018). These factors are also associated with poor infant psychomotor development. Maternal GAD has also been associated with somatic outcomes such as infant colic, food refusal, risk of recurrent abdominal pain, in infants, which are directly associated with infant psychomotor functioning (Akman et al., 2006; Ramchandani, Stein, Hotopf, & Wiles, 2006). These factors may be an important confounding factor in as far as the association between maternal GAD and infant psychomotor functioning is concerned.

However, on the contrary, other studies have found no association between maternal GAD in the postpartum period and infant psychomotor functioning (Reck, Van Den Bergh, et al., 2018). The few studies that have found an association between postpartum maternal GAD and infant psychomotor functioning have provided empirical evidence that postpartum maternal GAD may have detrimental effects. Furthermore, given the inconsistence in the findings from the different research there is a need for more research to be conducted since cognitive, language and social emotional skills are very important for other skills like problem solving, learning and communication.

2.7 Comorbidity of Postpartum Maternal Depression and Maternal GAD and Infant Outcomes

Several studies found that comorbid maternal depression and maternal GAD is common in the postpartum period (Falah-hassani et al., 2016; Heron, O'Connor, Evans, Golding, & Glover, 2004; Petzoldt et al., 2015). Unfortunately, very few studies have been carried out

researching the association between infant outcomes (infant growth and infant psychomotor functioning) and comorbidity of postpartum maternal depression and maternal GAD. Feldman et al. (2009) assert that women with comorbidity maternal depression and maternal GAD experience more multifaceted and severe symptoms which not only have negative consequences on them but also their children. For instance, Petzoldt et al. (2015) found that comorbid maternal depression and maternal GAD is a strong predictor of infant growth, especially among low birth weight infants and regardless of maternal parity status.

Comorbidity of maternal depression and maternal GAD in the postpartum period has greater impact on the mothers than postpartum maternal depression or maternal GAD operating in singularity (T. Field, 2017). Its consequences such as low partner support, poor maternal self-esteem and lower levels of breastfeeding self-efficacy are likely to be found in mothers with comorbid maternal depression and maternal GAD (Falah-hassani et al., 2016) which in turn may affect the infant's outcomes. Since numerous studies on maternal depression and maternal GAD are indicative of an association between infant outcomes and maternal mental illness, the effect from their comorbidity can presumably be worse than a postpartum maternal depression or maternal GAD operating in singularity.

Maternal depression and maternal GAD comorbidity is associated with unfavourable maternal behaviour such as controlling and over protection which all have negative consequences for infant outcomes (Martini, Asselmann, Einsle, Strehle, & Wittchen, 2016). The infants are likely to have feeding problems, spend more time in less alert states, sleeping less, with autonomic instability and less motor maturity (T. Field et al., 2003; Petzoldt et al., 2015) all of which are most likely to impact on their growth and development outcomes.

From the consequences that are associated with comorbidity of postpartum maternal depression and maternal GAD and research about the effects on infant outcomes from the singularity of these disorders we can, therefore, infer that a combination of these disorders

together will have disastrous effects on the infants. The consequences of comorbidity highlights the fact that it is a public health issue which, warrants more research so that evidence based early identification and preventatives strategies are developed (Falah-hassani et al., 2016).

2.8 Theoretical Points of Departure

, Bronfenbrenner's Bioecological theory (Bronfenbrenner & Morris, 2007) was used in this study. The Bioecological theory of development explains the different and complex environmental processes that are at play during the postpartum period and how they affect both maternal and infant outcomes.

According to Bronfenbrenner's Bioecological theory, environmental processes play a significant role as far as maternal mental illness, infant growth and development during the postpartum period is concerned (Bronfenbrenner & Morris, 2007). These processes can either exacerbate the development of both the mothers' mental illness or can act as a buffer to the mental illness. Furthermore, these environmental processes affect infant outcomes during the postpartum period. The theory focuses on the environment in which the infant develops, with a system of relationships while placing emphasis on the role of the biology of the child. It emphasises the interaction of a number of factors such as the community, the family environment, and the child's biological make up which work together to propel the child's development (Tudge et al., 2016). Changes within one or more systems inevitably affect the child's development and also the other systems.

According to Bronfenbrenner (1994), the whole ecological system is important in understanding human development and is composed of four socially organised subsystems that support human development: the microsystem, the mesosystem, the exosystem, and the macrosystem. The microsystem consists of the characteristics of the mother and the infant

that they bring into the postpartum environment. These include aspects such as personality traits of the mother and infant, the mother's communication and social skills, mother's age, and health status and the interaction that they have with their parents, siblings, other relatives, plus the infant, and interactions within that environment (Vélez-Agosto, Soto-crespo, Vizcarrondo-Oppenheimer, Vega-Molina, & García, 2017). This could also include the mother's ability to ask for support or help during this postpartum period.

The mesosystem is made up of the environment in which the mother and infant dyads interact. This consists of the home, neighbourhood, child care centres and connections between microsystems (Vélez-Agosto et al., 2017). The immeadiate mesosystem consists of the mother's spouse or caretakers in the postpartum period who are the frequent providers of social support. The role of a strong social support system is very important in determing positive results for maternal mental illness, infant psychomotor functioning and growth. As in many Africa countries, the extended family in Uganda, especially in rural settings, assumes the responsibility for looking after the new-born infant and the mother. The mother and new born infant in Uganda are usually looked after by either their mother or mother-in-law or a relative for a period of three months after birth (Callister, Beckstrand, & Corbett, 2010). The mother and her infant may either go back to her parents' home or her mother, or an elderly relative may come to her home and teach her how to look after the new born baby (Byaruhanga et al., 2011; Mbonye et al., 2012). However, it should be noted that the development of nuclear families within the African setting has brought about social isolation of families, affecting the tradition of the extended family giving social support, and most mothers are no longer getting the support they need. The mesosystem may also include aspects like relationship discord or intmate partner violence within the family.

The exosystem is the social settings that do not directly affect or influence the infant's experiences but are none the less important for the child's development; they may include the

parents' social network, parents' places of work, government and social policies. These may influence the level of care and support that is given to the mother and their infant, hence, exacerbating the mother's mental health and infant outcomes. For example in Uganda, high social status and power are accorded to women who conceive and give birth (Bantebya, 2009; Mbonye et al., 2012). Celebrations from friends, neighbours and the families of both parents of the new-born child normally follow the delivery. Therefore, after delivery, the mother and the infant may be accorded a lot of social support in view of the achievement that the mother has attained.

The macrosystem is the broadest level and includes aspects such as the laws of the country, customs, cultural beliefs and values (Berk, 2009; Vélez-Agosto et al., 2017). This system consists of factors that are essentially out of the mother or infant's control. Examples of the macrosystem may include mother's age, education, ethnicity and poverty. These components have been found to have a profound effect on both the mother and infant outcomes during the postpartum period.

While Bronfenbrenner's ecological theory focused mainly on the context, he later added another component of the chronosystem which focuses on the role of the person (Bronfenbrenner & Morris, 1998; Vélez-Agosto et al., 2017). This chronosystem is referred to as the temporal dimension, since the infant's environment is not static, continuously changes and does not affect the child uniformly (Vélez-Agosto et al., 2017). With the inclusion of the chronosystem, Bronfenbrenner developed the Bioecological Theory or the Process-Person-Context-Time model (PPCT), which looks at development as a continuous process with biopsychological aspects (Bronfenbrenner & Morris, 2007). The PPCT has four components that include proximal processes, person, context and time. According to Tudge et al. (2016), the four components of the PPCT have to be studied concurrently in order to clearly understand infant psychomotor development.

The process component includes the interaction between the infant and the environment, which is referred to as the proximal processes and is theorised as embodying the contributing factors of human development (Bronfenbrenner & Morris, 2007). Through these interactions infants come to understand the world around them, their position in it and play a part in changing it (Tudge, Mokrova, Hatfield, & Karnik, 2009; Tudge et al., 2016). However, the influences of these processes are affected by factors such as the infant's characteristics, the context in which the infants are born and or raised and the time period (Bronfenbrenner & Morris, 2007). The person component focuses on the personal characteristics that infants come with when they are born and become part of the new environments into which they are born (Bronfenbrenner & Morris, 1998). The context component entails the original four systems of Bronfenbrenner's first theory, which are the microsystem, the mesosystem, the exosystem and the chronosystem (Bronfenbrenner & Morris, 2007). The final element of the PPCT model is time, which is divided into micro-time and macro-time (Tudge et al., 2009, 2016).

According to Tudge et al. (2016), scholars may use either Bronfenbrenner's earlier ecological theory or Bronfenbrenner's Bioecological Theory of Human Development, or even focus their research on only some of the PPCT concepts. In this study, I used the Bronfenbrenner's Bioecological Theory of Human Development which emphasises the PPCT model. PPCT components were used in the research process and in the interpretation of the study findings. Under proximal processes, I assessed infant psychomotor development and maternal postpartum depression and GAD, while person characteristics include ethnicity, occupation, mother's and father's ages, marital status, education level, planned/unwanted pregnancy, birth position of the infant, birth weight of the infant, infant's previous illnesses, sex of the infant and feeding habits of the infant. The level of poverty in the family was used to study the context in which child development occurs. This study was longitudinal in

nature, during which time mother-infant dyads were studied at six weeks and six months postpartum.

2.9 Conclusion

Maternal mental illness (postpartum depression, GAD and their comorbidity) during the postpartum period affects a proportionate number of women and their infants. It should be noted that a large number of these women live in LMICs since HICs experience lower prevalence compared to LMICs.

From the above review of literature that examined the association between maternal mental illness, infant growth and development, it can be concluded that there are inconsistencies in the findings of the various studies. For example, whereas many studies in HICs have found no association between maternal mental illness and infant growth, studies in the LMICs have found a significant association. As far as infant psychomotor functioning is concerned in both LMICs and HICs some studies have found an association while others have found none. These inconsistencies may be attributed to number of factors such as the study tools used, sample sizes, and the cultural context of the studies. Although many studies have found an association there is still a need to close this knowledge gap by carry out more studies. Thus, there is the need for further research enquiry.

Furthermore, the review of literature revealed that very little is known about GAD and its association with infant growth and development. Additionally, few studies have been conducted on maternal mental illness in the postpartum period in Uganda. The few available studies focus on the prevalence and predictors of maternal mental illness. None of the studies focuses on the association between maternal mental illness and its effects on infant growth and development.

The effects of maternal mental illness on both infant growth and development in the postpartum period are not adequately understood. It is with this literature review background that the present study sets out to examine the prevalence of postpartum maternal metal illness (Depression and GAD in rural Uganda), to examine whether postpartum maternal depression and postpartum maternal GAD are associated with infant psychomotor development and infant growth, and to assess the association between poverty, marital discord, social support, and infant psychomotor development and infant growth. Moreover, given the inconsistent nature of the literature review in both HICs and LMICs, the present study aimed at providing information on the prevalence of postpartum maternal depression and maternal GAD plus their comorbidity. Furthermore, this study will provide momentous information which will be used in designing and putting into practice different interventions.

Bronfenbrenner's bioecological theory is used in this study because of its ability to explain the complexities of developmental transformations. This theory helps us to understand the development of the infant and the mother as interdependent components of the larger system. This theory focuses on four components (the person's characteristics, the context, the time and the synergistic interconnections) which simultaneously influence the development of the infant.

Chapter 3: Methods

3.1 Introduction

This chapter presents the methods of the study. In this chapter I outline research design, study location, and the study participants. These sections are followed by a section where I describe the study procedure and data collection process, followed by a section highlighting the study measures. The next section discusses data entry followed by a section on data analysis. Finally, ethical clearance and consideration procedures, which included ethical clearance and the process of obtaining verbal and written informed consent from the participants, are highlighted.

3.2 Research Design

The study is quantitative in nature and a longitudinal cohort study design with two phases was used. Longitudinal cohort study designs are studies where the same sample is followed up at different points in time (Caruana, Roman, Hernández-Sánchez, & Solli, 2015). In this study, mother-infant dyads were assessed at six weeks postpartum (baseline) and followed up when the infants were six months old (follow-up). This was done to measure associations over time, to assess infant psychomotor functioning at six months – which is difficult to assess at six weeks, and to assess the association between maternal mental illness and infant growth and infant psychomotor functioning during the postpartum period. This research design was used to study maternal depression, maternal AADA or maternal GAD and maternal psychological distress as well as infant growth and psychomotor functioning over a period of time. It was also used to determine whether poverty, relationship discord, and social support affect maternal depression, maternal AADA, maternal GAD, infant psychomotor development and infant growth over a period of time.

3.3 Study Location

3.3.1 Uganda

Uganda is a land-locked country located in East Africa (Figure 3.1) with a total area of 241,551 km^2. Most is land (199,807.8 km^2) while 41,743.2 km^2 is covered by open water and swamps. The country shares borders with Kenya to the east, South Sudan to the north, Democratic Republic of the Congo to the west, Rwanda to the southwest, and Tanzania to the south. Lake Victoria in the southern part of the country shares borders with Kenya and Tanzania.

The country has a population of 44.5 million people of which 50.74% were female and 49.26% were male (World Population Review, 2019). Forty-nine per cent (49%) of the population is below the age of 15 years, and the fertility rate is 6.2 children per woman. Over 82.9% of the population live in rural areas, while 17.1% live in urban areas of the country (Uganda Bureau of Statistics, 2017b). Uganda's literacy rate is 73%, although men have higher literacy rates (79% for the men and 67% for the women) (Uganda Bureau of Statistics, 2017b).

The infant mortality rate in Uganda is 54 deaths per 1,000 live births. The mortality rate of children under the age of five years is 90 deaths per 1,000 live births (Uganda Bureau of Statistics, 2017b). Delivery by Skilled Attendant Rate in 2016, was 74% compared to 58 % in 2011 or 42 % in 2006 (Uganda Bureau of Statistics, 2017b). There has been great improvement as far as women's giving birth in health facilities is concerned. In 2016, 73% of the mothers gave birth in a health facility compared to 57% of the deliveries in 2011 (Kiapi, 2017).

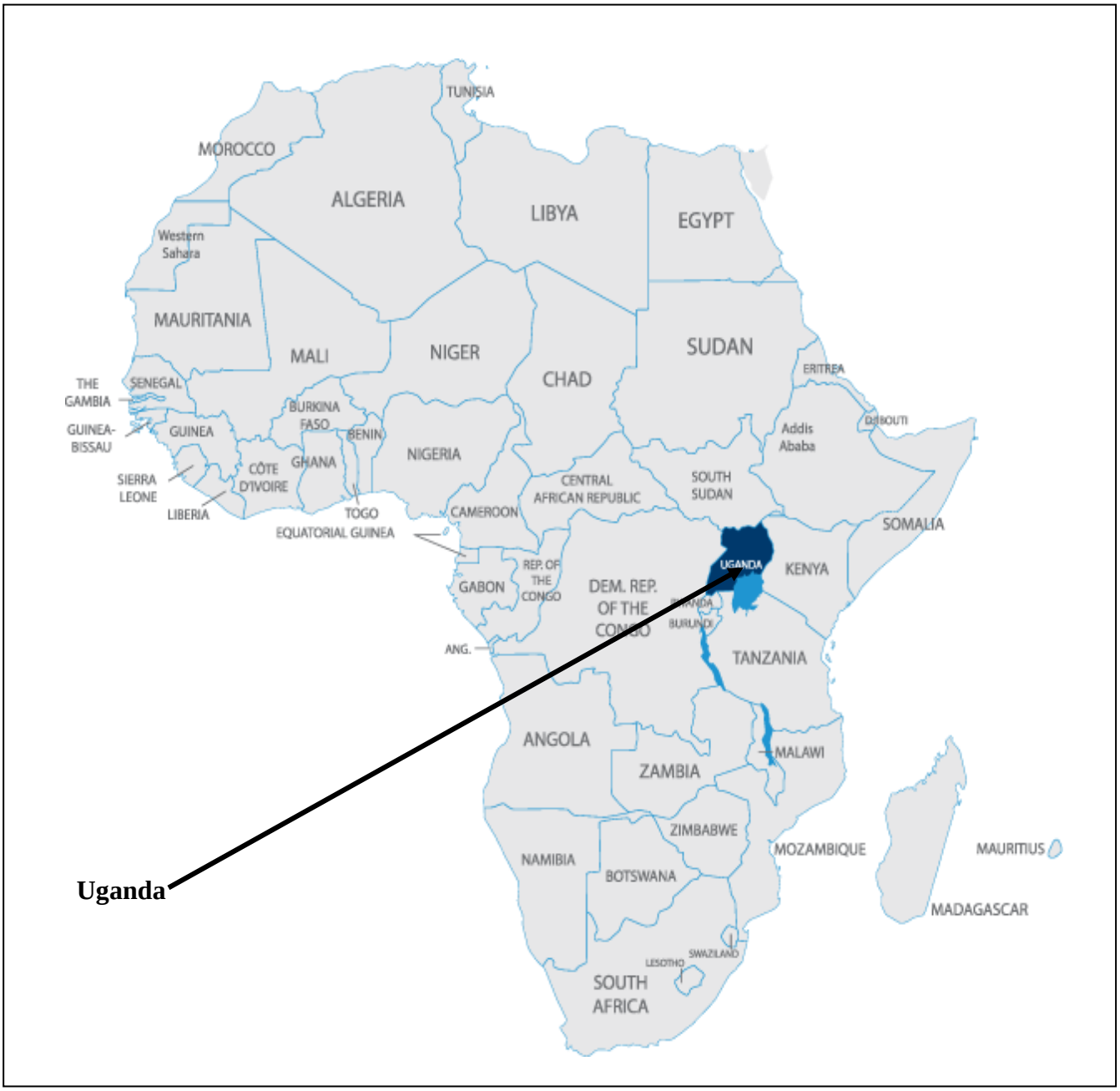

Figure 3.1. Map of Africa showing the position of Uganda.

Uganda is a low-income country, and the economy predominantly depends on agricultural products with most people practicing subsistence agriculture. The country has a gross domestic product (GDP) estimated to be US$506 per capita (The International Bank of Reconstruction and Development and The International Development Association World Bank (IBRD-IDA World Bank), 2016). Thirty-five per cent (35%) of the population is living

below the international poverty level of US$1.25 per day, which is about 4,698.81 Uganda shillings per day (IBRD-IDA World Bank, 2016).

3.3.2 Masaka District

This study was conducted in Masaka District in Uganda (Figures 3.2 and 3.3). Masaka District is a rural setting located in the south-western part of the country about 140 km from Kampala, Uganda's capital city. Masaka District lies between 0° and 25° South and 34° East, with an average altitude of 1,150 m above sea level and a total area of 1,603.3 km^2 (Uganda Bureau of Statistics, 2017b). It is surrounded by five districts: Kalungu to the north, Kalangala to the east, Lwengo to the south, Bukomansimbi to the southeast, and Rakai to the west. Masaka District has a long shoreline along Lake Victoria and has a small lake called Nabugabo within its boundaries. However, the majority of inhabitants depend on agriculture and manual labour rather than fishing.

Masaka District has a population of 297,004 people of whom 145,552 (49%) are male and 151,452 (51%) are female (Uganda Bureau of Statistics, 2017a). It is predominately a rural area with a small section in an urban municipal setting where 11% of the district's population lives. The majority of the people (77%) are Buganda, 9% are Banyankole, 8% are Banyarwanda, and 6% belong to other tribes (Uganda Bureau of Statistics, 2017a).

Figure 3.2. Map of Uganda showing MasakaDistrict.

Masaka District was selected as the study area based on a number of criteria. It is predominantly rural and relatively close (131km) to the capital where I live and work. Close to 90% of the population in Masaka district live in rural settings (Uganda Bureau of Statistics, 2017a). It was also selected as it has three hospitals and 81 health centres, and almost half of all households (46%) are located within 1 km to 5 km from a health facility. However, it should be noted that in Masaka District, about 35.7% of the births take place in a health facility while the rest are home births (Uganda Bureau of Statistics, 2017a). Therefore, Village Health Teams (VHTs) were used for recruitment in order to identify participants (given the high level of home deliveries). Furthermore, it should be noted that Masaka district is one of the few districts in Uganda to fully embrace the concept of VHTs. The final criterion was that I was familiar with the local language used in Masaka District.

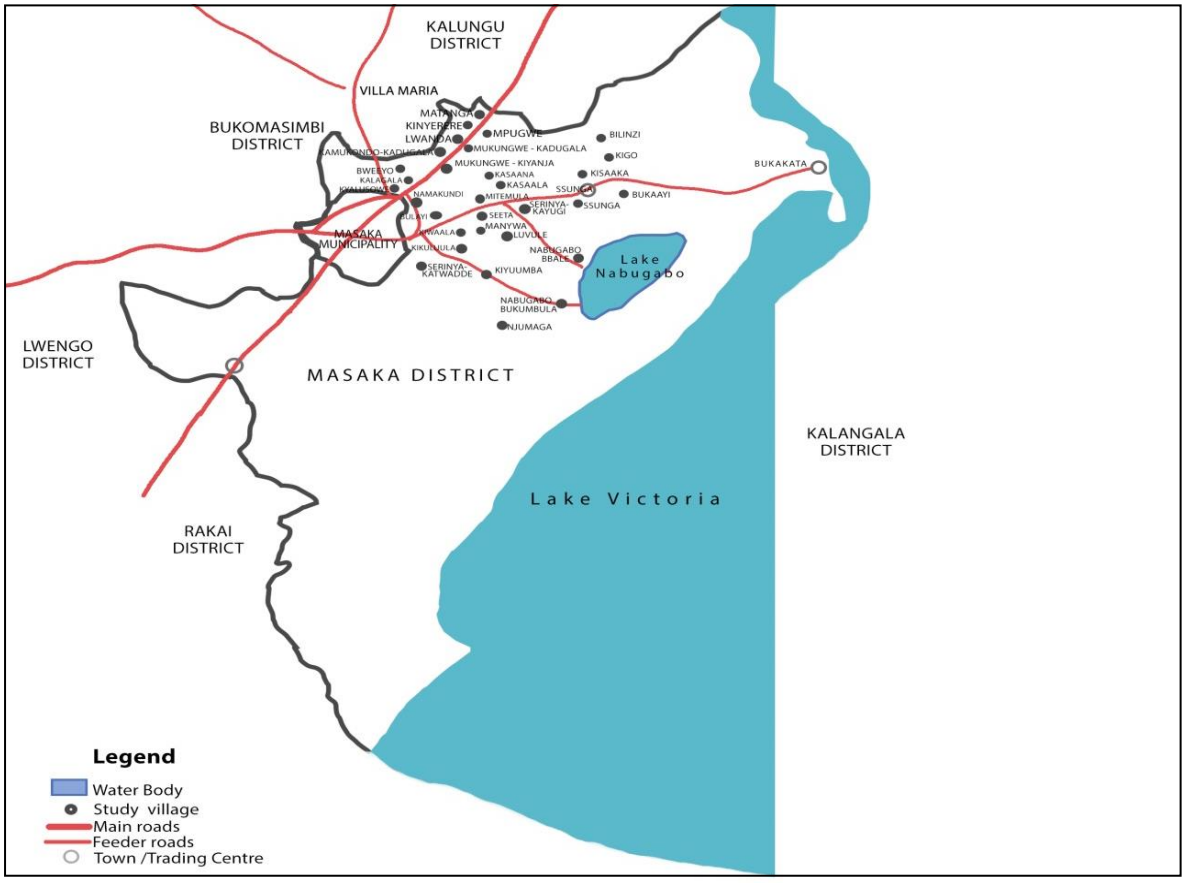

Figure 3.3 Map of Masaka District showing the villages visited in the study sites.

3.4 Study Participants

The participants in this study were females who had just given birth and were above the age of 18 years. These were recruited from their homes and interviews were conducted at the homes in a space that was deemed private in order to maintain confidentiality. All interviews were carried out in the participants' compounds. VHTs were used to identify participants who met the recruitment criteria. The recruitment summary and sample details are laid out at the beginning of Chapter four.

3.4.1 Inclusion and Exclusion Criteria

Only females who had just given birth to babies were recruited in this study. Participants were above 18 years of age and had babies who were six weeks old. These participants had to be permanent residents within Masaka District for ease of contact for follow-up when the infants were six months old. Participants who had infants above the age of six weeks were not included in the study. Those who had just given birth or had infants who were below six weeks old were given appointments for assessment when the infants were six weeks old. Mothers' who had given birth at health centres or hospitals, their hospital records pertaining to information regarding the date when the baby was born were obtained from the mothers in order to ascertain the actual age of the infant. Mothers who had given birth at home were asked for the date of birth which was also confirmed by the VHTs.

3.4.2 Sample Size

The Epi Info 7-STATCALC computer programme was used to determine the sample size (Dean et al., 2011). Assuming a confidence level of 95% and a prevalence of 20% (based on epidemiological postpartum studies conducted earlier in Uganda (Cox, 1983; Kakyo et al.,

2012; Nakku et al., 2006), and statistical power of 80%, a sample size of 105 respondents was determined.

In addition, cognisance was taken of the sample sizes of other prevalence studies in Africa (e.g., Adewuya, Ola, Aloba, Mapayi et al (2008) had 242 respondents; Chibanda et al. (2010) had 210 respondents; Cox (1983) had 183 respondents; Ndokera and MacArthur (2010) had 286 respondents; R. C. Stewart et al., (2010) had 501 respondents; Tomlinson, et al., (2006) had 147 respondents). This, coupled with the numerous sub-analyses at both bivariate and multivariable levels that I intended to conduct, a larger sample size was required. In view of these factors, and an attrition rate of at least 20%, as well as cost considerations, a total sample size of 167 mother-infant dyads was obtained.

3.5 Study Procedure and Data Collection

3.5.1 Training of Study Staff

3.5.1.1 Kilifi Developmental Inventory (KDI) Training

I was trained in the administration of the Kilifi Developmental Inventory (KDI) by Amina Abubakar (PhD) and her research team at Kenya Medical Research Institute (KEMRI) Wellcome Trust Research Programme, Centre for Geographic Medicine Research (Coast), Kilifi, Kenya. The training entailed a review of the KDI training manual, review of their previous training videos and training in interviewing skills. I practiced with six mothers and their babies as far as administering and scoring the KDI and received feedback from the Kilifi training team. After my training in the administration of the KDI, I was able to train the research assistants in its administration.

3.5.1.2 Research Assistants

Three clinical psychology postgraduate students from the Department of Mental Health and Community Psychology at Makerere University were hired as research assistants. Final year clinical psychology students collected the data, and the time spent on the project was considered as their internship project for that academic year. Permission to work on the project was obtained from the Head of Department. Although their working on the project was considered part of their academic work/internship project, they were paid as research assistants. One research assistant completed all baseline assessment while the other two joined the fieldwork trips at follow-up.

The research assistants were selected based on how fluent they were in speaking and reading Luganda as a language and previous work experience. They all underwent rigorous protocol training. Each questionnaire was reviewed, and an explanation was given in detail on what it measured and why it was being used. After the overview of the research protocols and questionnaires, the research assistants practiced administering the questionnaire on one another.

Several practice sessions for the general questionnaires were conducted. After these sessions, the research assistants then piloted the questionnaire on volunteer mothers. For the KDI, the research team practiced for a period of two months. The research assistants practiced on one another before practicing on infants who were brought in by volunteer mothers. During all the training sessions, feedback from the research team was of key importance and areas in which one could improve were emphasised.

3.5.1.3 Village Health Teams (VHTs)

VHTs are community-based individuals who volunteer to serve and promote good health in a particular village (Taylor, 2009; Turinawe et al., 2015). They are well-known members of the

community and live within the community they serve. They are in constant interaction with community members and dialogue with them on health-related issues such as immunisation of children, malnutrition, birth control, and contraceptives use. The objective of creating the VHTs within the community was to ensure community members' participation and involvement in positive health behaviour practices. The responsibilities and roles of the VHTs include making home visits, following up on discharged patients, distribution of health commodities and information, plus mobilisation of community members for health-related activities and services (Ministry of Health Uganda, 2010; Turinawe et al., 2015). One of the most important roles of VHTs is to follow up on mothers during the antenatal and postpartum periods. It is against this background that they were deemed to be the best people to identify and locate mothers who had just given birth or had babies who had not yet turned six weeks old. The VHTs also helped the team remind the mothers when the next study visit was to take place.

A total of 10 VHT members were recruited and trained with regard to their role of helping in the process of recruitment of respondents since they were well conversant with the study area. VHT members were trained for a period of one day. During the training, the aims and objectives of the study were explained to them. The sample recruitment criteria, which included whom to include and whom to exclude, were discussed in detail. The VHT members were also taught how to make and confirm appointments with respondents. Ethical considerations such as voluntary participation and confidentiality of information during the research were highlighted. Toward the end of the training session, the VHT members were given an opportunity to ask questions, and I clarified areas that they might have misunderstood.

3.5.2 Pilot Testing and Pretesting the Relationship Discord Scale

Only the Relationship Dynamics Scale (RDS) was pilot tested in Uganda since all the other measures and questionnaires had been used or validated in our setting. Permission was sought from the directors of three health centres located in the rural setting of Luwero, Wakiso, and Entebbe districts. A total of 78 mothers who had taken their infants for immunisation at six weeks postpartum were approached and requested to participate in the pilot testing. Only 70 agreed to participate and be interviewed using the Luganda version of the RDS. Each mother was briefed on the purpose of the exercise and each interview took approximately 30 to 45 minutes. The mothers were asked to answer the eight questions related to how they rated their relationships with their spouses or partners. The research team discussed with the respondents if they had understood the questions they were being asked or if they felt some questions needed to be changed or reworded. After this process, some words were changed and amendments were made to those questions which were not understood by the majority of the respondents.

3.5.3 Baseline Data Collection

Baseline data collection was done in the homes of the participants and began in January 2013 and ended in May 2013. At baseline, two visits with VHTs were made to the homes of mothers with infants. The first visit was to assess whether the mother met the inclusion/exclusion criteria. For mothers who met the inclusion criteria, the principal investigator (SK) explained the purpose of the study plus the ethical considerations and permission was sought from them to participate in the study. Fathers who were found at home were briefed about the aims and the objectives of the study and permission to conduct the study was sought from both parents.

In homes where only the mother was found, she was asked to inform the father of the infant about the study and also seek his permission to participate in the study. This was done based on the cultural norm of the area that the father is the head of the homestead. During this visit, the P.I explained to the mothers the purpose and aim of the study, why they had been selected to participate, what would happen if they agreed to take part, the benefits of the study, and whom to contact in case they had questions. The mothers were asked if they were permanent residents of the district or whether they were visiting. Those visiting a particular homestead were excluded from the study because it would be hard to locate them at follow-up.

Mothers who were permanent residents of the districts were asked to provide the exact date the infant was born in order to assess whether they met the inclusion criteria. For infants who had just been born or who were less than six weeks old, their mothers were given appointments in order that the team could visit them on the day the infant reached six weeks old. The mothers' contact details were recorded and directions to their homes were written down in detail.

When the infant reached six weeks old, the research team returned to the respondent's home, and informed consent was obtained. Parents who could read were given the consent form to read, whereas parents who could not read listened to a team member read the consent form. After reading/listening to the form, respondents were allowed to ask questions and ask about any section(s) they did not understand. After agreeing to participate in the study, they were requested to either use their thumbprint or sign two copies of the consent form. One copy was left with them while the second copy was retained by the research team. Those who chose not to consent or chose to withdraw from the study were permitted to do so.

In order to ensure confidentiality, the interviews of those who consented to participate were conducted from the respondent's compound instead of inside the respondent's house,

away from other people within the homestead. Luganda was used during the interview. At the baseline, two babies died before they could be assessed. Their mothers were given grief counselling by the team and referred to the nearest health centre for further counselling. Six mothers who met the inclusion criteria but did not wish to participate in the study were not interviewed.

3.5.4 Follow-Up Data Collection

Follow-up of study participants started in June 2013 and ended at the end of October 2013. Mothers were contacted by telephone one week prior to their appointments. Those who did not have telephones were contacted by the VHTs to remind them of their scheduled visit. Mothers re-consented to participate in the study. At follow-up, psychomotor development was assessed, and the infant's weight and height were measured. The mother's social support, relationship discord, postpartum depression, and postpartum GAD were also assessed.

At follow-up, a total of 18 mother-infant dyads (10.8%) who had participated at baseline could not be interviewed because they had either relocated, were not found at home, or did not wish to participate. For mothers who were not found at home, the research team visited their homes a maximum of three times before they were considered lost for follow-up. Of the mothers lost for follow-up, seven had relocated either outside or within Masaka District and could not be contacted, eight were not found at home, and three did not wish to continue participating in the study.

Figure 3.4. Assessments conducted at baseline (six weeks postpartum) and follow-up (six months postpartum).

3.5.5 Quality Assurance

Quality of the data was paramount throughout the entire process of collecting data. Before leaving a respondent's home, all questionnaires were cross-checked for completeness and to ascertain that all applicable questions had been asked. A study number was assigned to the questionnaire after conducting the interview. The questionnaires were then placed in a plastic bag and locked in a secure place. On a weekly basis, questionnaires were filed in order of the study number to ensure that all collected data were present.

3.6 Measures

3.6.1 Sociodemographic Questionnaire

A sociodemographic questionnaire (see Appendix A) was used to record participant's characteristics such as ethnicity, age, religious affiliation and marital status, while the infant's characteristics included birth position within the family, birth weight and height, previous illnesses and gender of the infant.

Poverty was measured using an asset register. A list of commonly owned assets in rural Uganda was developed based on the Uganda Demographic Health Survey (DHS) (Uganda Bureau of Statistics, 2011). The asset register was used to assess the presence or absence of different household items and to account for the possible lack of significant variance amongst households in terms of income and employment. The asset register as a measure of poverty has been used in Uganda and in other studies worldwide to develop wealth indices (Nkonki, Chopra, Doherty, Jackson, & Robberstad, 2011; Tylleskär et al., 2011; Waiswa et al., 2008).

3.6.2 Maternal Mental Illness

3.6.2.1 The Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV Axis I Disorders–Research Version–Non-Patient Edition (SCID-I-RV/NP)

The SCID-I-RV/NP (Appendices B and C) was used as a gold standard for the diagnosis of depression and Maternal AADA or GAD. The non-patient version, which is used in studies where participants are not psychiatric patients and focuses on research, was used in this study (First, Spitzer, et al., 2002). The SCID-I-RV/NP can be used to make major DSM-IV-TR diagnoses for community samples. The items on the SCID-I-RV/NP are coded as zero for inadequate information, 1 for absent or false, 2 for sub-threshold, and 3 for threshold or true for the symptoms that the respondent has expressed.

The SCID-I-RV/NP was administered by the Principal Investigator (PI) who is a qualified clinical psychologist. It should be noted that DSM-IV –TR diagnostic criteria were used in this study and not the DSM-V[2]. At baseline (six weeks), mothers who met the criteria for GAD but did not meet the six months duration were diagnosed with AADA (American Psychiatric Association, 2002; Matthey et al., 2003; Reck et al., 2008; Wenzel et al., 2003). Reliability coefficients range from 0.70 to 1.00 (First, Gibbon, Spitzer, & Williams, 2002). The SCID-I-RV/NP has been used as a gold standard in Uganda to study the risk for depression (Kinyanda et al., 2011).

3.6.2.2 Edinburgh Postnatal Depression Scale

The Edinburgh Postnatal Depression Scale (EPDS) (see Appendix D) is a 10-item questionnaire, of which seven measure depressive symptoms and three measure anxiety

[2] The DSM-IV-TR diagnostic criteria was used because the items on the SCID-IV which was used as the gold standard in this study were designed based on the DMS IV –TR criterion (First, Gibbon, et al., 2002).

related symptoms. Although the EPDS can be used as a pencil-and-paper test for participants who can read and write, in this research it was used as an interview tool. Participants were asked questions and were given the opportunity to select one of four responses that most closely represented how they had been feeling over the past seven days. Each item has a value of zero (symptom not present) to three (symptom very intense). The highest score a respondent can obtain is 30; the lowest zero. Seven items (3, 5, 6, 7, 8, 9, and 10) are reverse coded. The scores for the 10 items are added to obtain a total score out of 30.

The EPDS is the most commonly used instrument in the world for screening postpartum depression because of its high level of accuracy, specificity and sensitivity (G.-C. Ali, Ryan, & De Silva, 2016; Chorwe-Sungani & Chipps, 2017; Gibson, Shakespeare, Price, & Gray, 2009). For Postpartum depression it has a sensitivity ranging from 59% to 100% and a specificity of 44% to 97%, which depends on the gold standard reference used for diagnosis, cut-off scores selected, and geographical location of studies (Novotney & Maurer, 2017). In Africa, it has been used and validated in countries such as South Africa, as recorded by De Bruin, Swartz, Tomlinson, Cooper, and Molteno (2006), Zimbabwe, Chibanda et al., (2010), Nigeria, Taiwo and Olayinka (2007), Malawi, R. C. Stewart et al. (2010), Ghana Weobong et al. (2009), and Ethiopia, Servili et al., (2010). In South Africa, the EPDS reported a Cronbach's alpha of 0.61, a sensitivity of 69%, and a specificity of 78% (Rochat, Tomlinson, Newell, & Stein, 2013).

The EPDS was partly developed in Uganda (Cox, 1983, 2019). In the EPDS development study conducted in Uganda and Scotland, it had a sensitivity of 85% and a specificity of 77%, with a positive predictive value of 83% (Cox, 1983; Cox et al., 1987). The EPDS had a standardised coefficient of 0.87 and the split-half reliability of the scale was found to be 0.88. It has been used in rural Uganda with a cut-off point of 10 and was found to be valid and reliable (Kakyo et al., 2012).

Based on the ROC curve analysis for this study a cut off of 11 was used. Different studies have recommended different optimal cut-off points for the screening of depression using the EPDS. These cut-off points are determined by maximising sensitivity of the scale while minimising its specificity. The EPDS cut-off points from different studies and different settings range from 2/3 to 12/13 (Cox, 2019; Cox et al., 1987; Hanlon et al., 2008; Tran et al., 2011; Uwakwe, 2003; Weobong et al., 2009). A number of factors such as cultural differences, test-taking familiarity, and study setting – urban studies vs. rural studies – have been attributed to these variations in cut-off points (Cox, 2019; Tran et al., 2011).

3.6.2.3 The Self-Reporting Questionnaire (SRQ-20)

The SRQ-20 (see Appendix E) is a 20-item questionnaire used to measure psychological distress. It is a screening tool designed by WHO to detect common mental disorders and also assesses GAD, depression and somatic symptoms (World Health Organization, 1994). The items enquire about symptoms in the last 30 days. Answers are yes or not with a yes response being scored as a 1 and a "no" response scored as zero. The maximum score is 20, while the minimum score is zero. The SRQ-20 was originally designed as a self-administered scale, although it is suitable for interviews as well. In this study, the SRQ-20 was used as an interviewer-administered questionnaire for all respondents because of the low literacy levels in Masaka District.

The SRQ-20 has different cut-off points in detection of psychological distress in Africa. In Rwanda, for example, a cut-off point score for men of 10 has been used while the cut-off point for women was 8 (Scholte, Verduin, van Lammeren, Rutayisire, & Kamperman, 2011). In Nigeria, a score of 8 was used to diagnose psychological distress whereas in Ethiopia and Malawi the SRQ-20 cut-off points were set at 7/8 (Harpham et al., 2005; Ola et al., 2011; R. C. Stewart et al., 2009). In South Africa, van der Westhuizen, Wyatt, Williams,

Stein, and Sorsdahl (2017) found optimal cut-off scores of 6/7 and 4/5 for women and men respectively.

The scale has been used in Africa with good reliability scores reported. In Rwanda, the SRQ-20 has high reliability coefficients of 0.81 for men and 0.85 for women with a score of 10 as the optimal local cut-off point (Scholte et al., 2011). The SRQ-20 in Rwanda had a sensitivity of 69% and a specificity of 79% (Scholte et al., 2011). In Ethiopia, Hanlon et al. (2015), using the area under the receiver operating characteristic curve found the SRQ-20 to have good performance using the Mini International Neuropsychiatric Interview as the gold standard . Prior to this, Hanlon et al., (2008) found a sensitivity of 85.7% and a specificity of 75.6% for the SRQ-20. In Ghana, Weobong et al. (2009) found an internal consistency of 0.78 and a criterion validity of 0.74, while Ola et al. (2011) found the inter-rater reliability using a kappa coefficient of 0.89.

The SRQ-20 has also been widely used and validated outside Africa. For instance, in the United Kingdom, Nusrat Husain et al. (2016) validated the SRQ-20 in British Pakistani and White European population with the Schedule for Clinical Assessment in Neuropsychiatry (SCAN) and found an optimum cut-off point at 7 for the White European population an optimum cut-off point for the British Pakistani population of 6. de Paula, Corrêa, da Silva, and Malloy-Diniz, (2017) found an internal consistency of 0.86, test-retest reliability of 0.88 and cut off points of ± 4 points for clinical work and ± 5 points for the research contexts.

Based on the ROC analysis in this research, the cut off point for this study was 5, similar to a study that validated the SRQ-20 in Uganda (Nakigudde, Tugumisirize, & Musisi, 2008). However, in another study in Uganda the cut-off was set at 6 (Abbo et al., 2008). The Uganda-validated SRQ-20 version was reported to have registered a Cronbach's alpha of

0.84 on reliability and a good internal consistency ranging between 0.7 and 0.78 (Nakigudde et al., 2008).

3.6.3 Relationship and Social Support

3.6.3.1 The Relationship Dynamics Scale (RDS)

Relationship discord was measured using the RDS (see Appendix F) developed by Stanley and Markman, (1997) in the USA. It has eight items and measures relationship patterns in escalation, interaction, and thought, such as withdrawal or invalidation. The items in the RDS describe problems that are likely to occur in a relationship, and the respondent is requested to indicate how often these problems occur in their interpersonal relationships.

The RDS has a three-point scale with scores ranging from "never" which is scored as 1, "once in a while" which is scored as 2, and "frequently" which is scored as 3. Answers are indicative of the seriousness of the problems in the relationship. All the items on this scale are negatively worded – a high score reflects a relationship with problems. The minimum total score that a respondent can obtain is 8 and the maximum total score is 24. Respondents who score from 8 to 12 have low levels of relationship discord. Those who score from 13 to 17 have moderate levels of relationship discord, while those who score from 18 to 24 are at high risk of relationship discord (Simons, Reynolds, Mannion, & Morison, 2003).

S. P. Carter et al. (2016) found RDS to have reliability with a Cronbach's alpha of 0.76. Furthermore, in another study, the RDS had a Cronbach's alpha of 0.88 for internal consistency (Simons et al., 2003). In a study on hope-focused and forgiveness-based group interventions to promote marital enrichment, the RDS was found to have high reliability with a Cronbach's alpha of 0.81 (Ripley & Worthington Jr, 2002). The RDS has excellent validity with a coefficient alpha of 0.73 (Stanley et al., 2001).

3.6.3.2 The Multidimensional Scale of Perceived Social Support (MSPSS)

The MSPSS (see Appendix G) was developed by Zimet et al., (1988), and measures perceived social support. The MSPSS is a brief questionnaire with 12 questions and contains three subscales of support from family, friends and significant others. Each subscale has a total of four questions. Items 1, 2, 5 and 10 measure perceived support from significant others. Items 3, 4, 8 and 11 measure perceived support from family, while items 6, 7, 9 and 12 measure perceived support from friends. The MSPSS is a seven-point Likert scale with scores ranging from "very strongly disagree" (1) to "very strongly agree" (7). A total score for the full scale is obtained by adding all the scores. Respondents' scores range from 12 to 84, while total subscale scores range from 4 to 28, with high scored indicating good social support. In this study on the MSPSS a median value of 48 points was used as a cut off point (Kim, Jung, Cho, Park, & Kim, 2019).

The MSPSS has been widely used and found to have satisfactory psychometric properties (Osman, Lamis, Freedenthal, Gutierrez, & McNaughton-Cassill, 2014). In its development, the MSPSS was found to have a full-scale Cronbach's alpha of 0.88 while the subscales of significant other, family and friends had Cronbach's alphas of 0.91, 0.87 and 0.85, respectively (Zimet et al., 1988). In the same study, the test-retest reliability coffiecient for the full scale was 0.85, and the subscale of significant other, family and friends had coefficients of 0.72, 0.85 and 0.75, respectively (Zimet et al., 1988). Tsilika, Galanos, Polykandriotis, Parpa,and Mystakidou, (2019) and Bugajski, Frazier, Moser, Lennie, and Chung (2019) found that the subscales of significant other, family and friends demonstrated stability intraclass correlation coefficient (>.90) and excellent internal consistency reliability (Cronbach's as>.90).

The MSPSS's validity for the friends, family and significant others subscales was found to be 0.86, 0.68 and 0.87, respectively (Guan et al., 2013). In another study that

validated the Swedish version of the MSPSS, the intra-class correlations ranged from 0.89 to 0.92, and Lin's concordance coefficients ranged from 0.89 to 0.92, with test-retest coefficients for items ranging from 0.58 to 0.85 (Ekbäck, Benzein, Lindberg, & Arestedt, 2013). The Thai version of the MSPSS showed high Cronbach's alpha of 0.91 for internal consistence on the full scale while the subscale of friends, family and significant others had alphas of 0.91, 0.83 and 0.86, respectively (Wongpakaran, Wongpakaran, & Ruktrakul, 2011).

The MSPSS was validated in Uganda at six weeks postpartum on mothers who had taken their infants for immunisation and was found to be valid and reliable (Nakigudde, Musisi, Ehnvall, Airaksinen, & Agren, 2009). The validated MSPSS Uganda version had a Cronbach's alpha of 0.83, showing good internal consistency (Nakigudde et al., 2009). The internal consistency coefficients were 0.82 for the family subscale, 0.80 for the friends subscale and 0.79 for the significant others subscale (Nakigudde et al., 2009). These high coefficients show that the MSPSS has high cross-cultural stability in measuring perceived social support.

3.6.4 Infant Growth and Psychomotor Development

3.6.4.1 Infant Growth

Both the weight and height of infants were measured at six weeks and at six months of age. Infants were weighed using a portable digital weighing scale accurate to 0.01 kg. Where possible, infants were undressed, and on rainy or cold days they were measured with light-weight clothes. The infants were weighed three times and the average reading to one decimal place was obtained. The weighing scale was checked daily for purposes of accuracy and often in the course of the day random auditing was done.

Each infant's height was measured with a tape measure. Two research team members were involved in the measurement of the height of the infant. The infant's head was held by one member of the research team to keep it flush with the tape measure while the other held the infant's legs flat so the heels would be well placed in position. For consistent results, height was also measured three times and an average result was selected.

3.6.4.2 Kilifi Developmental Inventory (KDI)

Psychomotor functioning was assessed using the KDI (see Appendix H) at six months postpartum. The KDI was developed by Abubakar, Holding, Van Baar, Newton, and Van de Vijver, (2008) in Kilifi, Kenya, to measure the psychomotor development of children ages 6–35 months. The KDI has 69 items, and the child is given different tasks to perform as the researcher scores their performance in these activities. Items on the KDI have a dichotomous scale – if a child performs a given task, they are scored 1 and if the infant fails to perform the task they are scored 0. The raw score is obtained by adding the total score for locomotor skills and eye-hand coordination. The KDI administrators were blinded to the maternal mental illness of the respondents at both assessment points.

The KDI has an internal consistency of 0.96, test-retest reliability coefficient of 0.96, and an inter observer coefficient of 0.98 (Abubakar, Holding, et al., 2008). The subscale of locomotor skills has a test-retest coefficient of 0.61; eye-hand coordination subscale has a coefficient of 0.80, and the psychomotor subscale has a coefficient of 0.83 (Abubakar, Holding, et al., 2008). The KDI has a high validity coefficient of 0.93 with respect to age and 0.80 with respect to maternal reports (Abubakar, Holding, et al., 2008). The KDI registered satisfactory psychometric properties for use with excellent internal consistency of 0.96, inter-observer agreement of 0.98, and test-retest reliability of 0.96 (Abubakar, Holding, Newton, Van Baar, & Van de Vijver, 2009). The subscales are reported to have alpha coefficients of

0.61 for locomotor, 0.80 for eye-hand coordination, and 0.83 for psychomotor (Abubakar, Van de Vijver, et al., 2008). The KDI has been found to be a culturally appropriate tool in Uganda and has been translated and widely used (Elliott et al., 2007; Nampijja et al., 2010).

3.6.4.3 The Developmental Milestones Checklist (DMC)

The Developmental Milestones Checklist (DMC; see Appendix I) is a structured interview schedule designed for caregivers to provide reports on their child's development and consists of 66 items. It measures three domains of child functioning – psychomotor development, language development, and personal – social development of children between 3 and 24 months old. The DMC administrators were blinded to the maternal mental illness of the respondents at both assessment points.

The DMC full scale has a concurrent validity of 0.80 with internal consistency reliability of 0.94, and its subscales of motor, personal-social and language have coefficients of 0.91, 0.87 and 0.62, respectively (Abubakar, Holding, Van de Vijver, Newton, & Van Baar, 2010). The DMC has a retest reliability of 0.85 for the full scale, while the subscales of motor, personal-social and language have test-retest coefficients of 0.88, 0.67 and 0.66, respectively (Abubakar, Holding, Van de Vijver, Bomu, et al., 2010). The DMC has been used in West Africa. In a study conducted in Burkina Faso, the internal consistency of all three subscales and the total scale was greater than 0.70 and the inter-interviewer reliability for each score ranged from 0.81 to 0.93, while the test-retest reliability for each score ranged from 0.77 to 0.96 (Prado et al., 2013).

3.6.5 Translation of Measures and Consent forms

The Edinburgh Postnatal Depression Scale (EPDS), the Relationship Dynamics Scale (RDS), the Kilifi Developmental Inventory (KDI) and the consent forms were translated into the

Luganda language (a local dialect). The Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV Axis I Disorders–Research Version–Non-Patient Edition (SCID-I-RV/NP), The Self-Reporting Questionnaire (SRQ-20) and The Multidimensional Scale of Perceived Social Support (MSPSS) were not translated; existing Luganda language versions were used. The translated documents were back-translated to English to ensure better understanding and communication with study participants (Sperber, 2004). A Luganda-speaking expert from the School of Languages, Literature and Communication at Makerere University translated the consent forms and questionnaires into Luganda independently. The translator and the P.I discussed the translated versions. Technical terms that would be difficult to understand were removed. After deliberation, single versions of the documents were finalised. The Luganda-translated versions of the different documents were then given to another bilingual expert who translated them into English. The two English versions of the documents were then compared and the differences in these versions were further discussed by the team to come up with a final version.

3.6.6 Reliability Analysis of Study Questionnaires

The researcher used Cronbach's alpha to measure the scale's reliability. Results from the reliability analysis showed the following:

The Edinburgh Postnatal Depression Scale (EPDS) was found to have very good reliability for both baseline (0.847) and Follow-up (0.871) respectively. The Self-Reporting Questionnaire (SRQ-20) was found to have very good reliability for both baseline (0.857) and Follow-up (0.848) respectively. The Relationship Dynamics Scale (RDS) was found to have very good reliability for both baseline (0.780) and Follow-up (0.895) respectively.

The Multi-dimensional Scale of Perceived Social Support Scale (MSPSS) was found to have very good reliability full scale for both baseline (0.881) and Follow-up (0.871)

respectively. It should be noted that the subscales on the MSPSS at baseline had excellent reliability ranging from 0.885, 0.936 and 0.844 for the Family (Fam) subscale, Friends (Fri) subscale and Significant Other (SO) subscale respectively. While at follow-up, MSPSS had excellent reliability ranging from 0.984, 0.997 and 0.982 for the Family (Fam) subscale, Friends (Fri) subscale and Significant Other (SO) subscale respectively.

The Kilifi Developmental Inventory (KDI) was found to have very good reliability for Psychomotor functioning scale (.849). The subscales on the KDI subscales had an excellent reliability ranging from .767 and 0.831 for the locomotor subscale, and fine motor subscale respectively.

The Developmental Milestones Checklist (DMC) was found to have very good reliability for overall psychomotor functioning scale (0.839). The subscales on the KDI subscales had a good reliability ranging from .838,.745, .707 and .693 for the locomotor, fine motor, language, and personal-social subscale respectively.

Table 3.1

Cronbach's Alpha (α) for the study Questionnaires

Scales and Subscales	n	Baseline	Follow-up
		α	α
The Edinburgh Postnatal Depression Scale (EPDS)	10	.847	.871
The Self-Reporting Questionnaire (SRQ-20)	20	.857	.848
The Relationship Dynamics Scale (RDS)	8	.780	.895
The Multidimensional Scale of Perceived Social Support (MSPSS)			
Full Scale	12	.881	.871
Subscales:			
Family (Fam)	4	.885	.984
Friends (Fri)	4	.936	.997
Significant Other (SO)	4	.844	.982
Kilifi Developmental Inventory (KDI)			
Psychomotor Functioning	104		.849
Subscales:			
Locomotor	40		.767
Fine Motor	64		.831
The Developmental Milestones Checklist (DMC)			
Psychomotor Functioning	82		.839
Subscales:			
Locomotor	21		.838
Fine Motor	11		.745
Language	20		.707
Personal Social	29		.693

Note. n = number of items **α =** Cronbach's alpha

3.7 Data Entry

Data were entered by an independent research assistant, and all entries were crossed-checked against the questionnaire by the principal investigator. Every question in the database was cross-checked to make sure the correct answers had been entered. A total of 167 interviews from the baseline and 149 interviews were entered at follow-up.

Data were entered into IBM Statistical Package for the Social Sciences (IBM SPSS Version 23) computer programme. Data on infant growth, demographics, poverty, SCID, EPDS, SRQ-20, RDS, MSPSS and KDI were entered. Questions that needed to be reverse coded were entered correctly.

In order to make anthropometric calculations, sex of the infant, date of birth, dates of measurement at six weeks and six months postpartum, weight in kilograms and height in centimetres at six weeks and six months were entered in the World Health Organization's (WHO's) ANTHRO software (World Health Organization, 2011). The flexible exclusion method was used to handle outliers, as recommended by WHO, (1995).

3.8 Data Analysis

Data were analysed using the SPSS computer programme.

3.8.1 Univariate Analysis

Descriptive statistics were used to run frequencies and percentages for the sociodemographic data, prevalence of postpartum depression and Maternal AADA or GAD, psychological distress, relationship discord and social support.

WHO's ANTHRO software (World Health Organization, 2011) was used for the anthropometric calculations. Raw scores for the infant's weight and height were entered and a nutritional status index for weight for age Z-score (WAZ), height for age Z-score (HAZ) and weight for height Z-score (WHZ). The WHO Global Database Z score cut-off points were used to categorise infants as either suffering from under nutrition (< -2 standard deviation (SD) or overweight (> 2 standard deviation (SD) (De Onis & Blössner, 2003). Infants who scored < -2 SD on weight for age were considered malnourished while infants who scored < -2 SD on height for age were considered to have stunted growth.

Poverty was measured using an asset register, and a wealth index was constructed using principal component analysis (PCA) (Filmer & Pritchett, 2001). Assets were coded into binary variables; a respondent who had or possessed a particular item was given a yes response while those who did not have or own an asset were given a no response. Items that had a skewness score less than -2 or greater than +2 and items that had a kurtosis score less than -7 or greater than +7 were not used in the analysis. A factor analysis was run using PCA. Scores from the PCA were standardised in relation to a standard normal distribution with a mean of 0 and SD of 1. Using the first principal component from the analysis, the data from the households were divided into quintiles. The quintiles were categorised as follows: Lowest, Second, Middle, Fourth, and Highest (Rutstein & Johnson, 2004).

3.8.2 Bivariate Analysis

In the bivariate analysis, statistical significance was $p \leq 0.05$. Trends were reported when results fell between 0.056 and 0.099. Trends signify direction of association rather than significancy. The Bonferroni correction was used for multiple comparisons in order to account for Type one errors (A. Field, 2013). It also should be noted that the results in this study will be based on the SCID-I-RV/NP rather than the Edinburgh Postnatal Depression Scale (EPDS).

The Pearson chi-squared test was used for categorical data to find out whether there was a significant difference between sociodemographic characteristics among respondents as far as postpartum depression, postpartum maternal AADA and psychological distress were concerned at baseline. It was further used to find out whether there was an association with the same variables at follow-up.

Pearson Chi Square (X^2) analyses were conducted to test the association between social demographic charateristics and maternal mental Illness and the association between poverty relationship discord, social support and mental illness . The relationship between relationship discord social support, infant growth, and infant psychomotor development was tested using Pearson Product Moment Correlation Coefficient (*r*). Analysis of variance (F) was used to test the association between Comorbidity, infant growth and infant development. And the association between poverty, infant growth and infant development. An independent sample t-test was run to compare the means of infant growth and psychomotor functioning and maternal mental illness and exclusives breast feeding..

3.8.3 Multivariable Analysis

Variables that were found to have an association were further analysed using multivariable analysis (Hidalgo & Goodman, 2013).The multivariable analysis focuses on how several independent variables are related to one dependent variable (A. Field, 2013). It was used to predict outcome variables from several predictor variables. Multivariable linear regression and logistic analysis were used to assess whether the different predictor variables were significantly related to maternal mental illness, infant growth and infant psychomotor development.

The enter method or simultaneous multiple regression method was used in the analysis. In this method, all predictor variables were entered into the multivariable regression equation at the same time. This method helped the researcher explain how each independent (predictor) variable exclusively contributed to the outcome variables.

The enter method or simultaneous multiple regression method was used to find out how much the predictor variables that were found to be significant were able to explain the unique variance in infant growth and infant psychomotor development. Further analyses were carried out to find out how predictor variables like poverty, relationship discord, and perceived social support or those that were found to be significant were able to explain the unique variance in postpartum depression, postpartum maternal AADA or GAD and psychological distress at both six weeks and six months postpartum. The Hosmer-Lemeshow test (a goodness of fit test for logistic regression), the Cox and Snell test (Residuals), and the Nagelkerke test (amount of variance explained), which are the coefficients of determination for logistic regression, were used in the analysis (A. Field, 2013).

3.8.4 Receiver Operating Characteristics

Receiver operating characteristic (ROC) analysis was done for EPDS and SRQ-20 against SCID as the gold standard for both the baseline and the follow-up (J. V. Carter, Pan, Rai, & Galandiuk, 2016; Obuchowski & Bullen, 2018). ROC was used to determine the cut-off scores in the study population and to establish the instruments' overall accuracies. ROC is a graphical way of presenting sensitivity and specificity figures to establish a single cut-off score. Sensitivity values are plotted against specificity values. ROC analysis uses the area under the curve (AUC) to establish whether a measure can distinguish between two diagnostic groups.

AUC values range from 0 to 1.0, with 1.0 indicating a perfect prediction and 0.5 indicating a prediction of chance (Scholte et al., 2011). The value of the test being assessed should be greater than the chance prediction (AUC > 0.5). ROC curves for EPDS and SRQ-20 were developed by plotting sensitivity against specificity, and optimal cut-off scores for the two tests were established using maximum specificity that was not greater than sensitivity.

Table 3.2

Summary for Analytical Approach

Variables		Analytical approach	
1. Prevalence of postpartum depression and Maternal AADA or GAD		Univariate Descriptive	Frequencies and percentages
2. Sociodemographics, Poverty, Relationship discord, Social support		Univariate Descriptive	Frequencies and percentages
3. Sociodemographics	Postpartum depression Maternal AADA or GAD Psychological distress	Bivariate	Chi square
4. Postpartum depression Maternal AADA or GAD	Infant growth	Bivariate	Independent Sample T-test
5. Postpartum depression Maternal AADA or GAD	Psychomotor functioning	Bivariate	Independent Sample T-test
6. Poverty, Relationship discord, Social support	Infant growth	Bivariate	ANOVA Pearson chi-squared test
1. Poverty, Relationship discord, Social support	Psychomotor function	Bivariate	ANOVA Pearson chi-squared test
8. Predictor variables found to have an association		Multivariable	Logistic regression analysis
9. Validation of the EPDS and SRQ-20			ROC analysis of EPDS ROC analysis of SRQ-20

Note: GAD = generalised anxiety disorder; ANOVA = analysis of variance; EPDS= Edinburgh postnatal depression scale; SRQ-20 = self-reporting questionnaire; AADA= acute adjustment disorder with anxiety

3.9 Ethical Clearance and Considerations

3.9.1 Ethical Clearance

Research clearance was obtained at two levels. The research protocol was submitted to the Faculty of Health Sciences at Stellenbosch University, South Africa (ref S12/07/191; see Appendix J) and ethical approval was granted. The study was also granted ethical clearance from the National Council for Science and Technology, Uganda (ref: UNCST; SS 3021; see

Appendix K). Before the UNCST grants research approval, research protocols must be submitted to an Institutional Review Board (IRB). IRBs are institutional ethical review committees established in various university faculties and government organisations and are accredited by UNCST to evaluate research protocols for approval. This research protocol was submitted to the School of Health Sciences Research and Ethics Committee, College of Health Sciences at Makerere University (SHSREC REF 2012-023; Appendix L) for evaluation.

3.9.2 Informed Consent

Participation in the study was voluntary, and respondents who did not want to be part of it were not forced to do so. During the study, informed consent was obtained from each of the respondents who willingly wanted to participate. Those who agreed to participate signed a consent form. Respondents were given the choice of using a consent form written in either English or Luganda (see Appendix M) and were asked to either sign or write their names on the form. Those who did not know how to write were asked to use their thumb prints.

3.9.3 Confidentiality

Confidentiality was of utmost importance during the interviews. Mothers were interviewed alone and were assured during the entire research process that the information collected would be used only for research. An administrative database was established, and every mother was given a unique study identification number for confidentiality and to avoid a mix-up of data. Each dataset was collected and entered in the database and a copy placed in a plastic folder and locked in a cabinet for safety and confidentiality.

3.9.4 Research compensation

At baseline and follow-up, each respondent was given 20,000 Uganda Shillings (R80) as a compensation for the time spent during the interview. The infants were each given a stuffed animal toy or doll of a similar size at follow-up.

3.9.5 Autonomy

The participants were given an opportunity to have autonomy of thought, intention, and action when making the decision to be part of the study. The decision-making process to participate was free from coercion or coaxing. In order for the participant to make a fully informed decision, she was thoroughly explained to that there were no risks involved in participating and benefits of the participating.

3.9.6 Justice and Fidelity

The research was nondiscriminatory in nature. Participants were selected based on the inclusion and exclusion criteria. All participants were treated equally, fair, not arbitrary, and not capricious (in other words, equitable). The research team used "fidelity" at all times (Put the participants first in all aspects).

3.9.7 Beneficence

The study provided the intent of doing well for the participants involved. The research team was trained and maintained excellent research skills and knowledge, throughout the research there was continued training. The research participant's individual circumstances were considered.

3.9.8 Non-maleficence

During the research process no harm was done to any participant or others in society. No physical risks to the participants were associated with this study. Mothers who had severe depression or showed any signs of suicidal ideation were counselled by one of the research

team members and referred to the nearest hospital or health centre for psychological and psychiatric help. Ten respondents at baseline and five respondents at follow up were referred to the nearest health centre after giving them psychological first aid.

The results of the study are presented in the next chapter.

Chapter 4: Results

4.1 Introduction

This chapter presents the findings from the field research which included data from baseline and follow-up. The results focus on a rural setting that is Masaka District where where the data was collect. Futhermore, the results are based on the SCID as a gold standard rather than screening tools. The chapter has seven sections. The first section introduces the chapter. Section two is a description of the STROBE diagram (Von Elm et al., 2007, 2014) and an overview of the mother-infant dyads who were approached for inclusion in the study, the number who consented to participate in the study and the number who were lost for follow-up. Section three outlines baseline results at six weeks postpartum, while section four presents the follow-up results at six months postpartum and section five examines the effectiveness of screening tools for depression in the Ugandan context. Section six focuses on the multivariable analysis and examines how psychosocial factors are associated with maternal mental illness. The chapter ends with section seven outlining the summary of the results.

4.2 Recruitment Summary

A total of 193 women with new-borns babies were approached and invited to be part of the study (Figure 4.1). Of the 193 women who were approached, 167 mother-infant dyads gave their consent and participated in the study. Slightly more than 13% (24) of the women who were approached did not participate in the study because they were non-residents of the district (18 women), refused to participate (six women), or lost their infants before the assessment date (two women).

At follow-up, 149 mother-infant dyads were interviewed out of the 167 who had been enrolled and interviewed at baseline. Eighteen mother-infant dyads (10.8%) were lost for

follow-up because of relocation (seven women), not being found at home at the time of the interview (eight women), or refusal to re-consent (three women) (Figure 4.1).

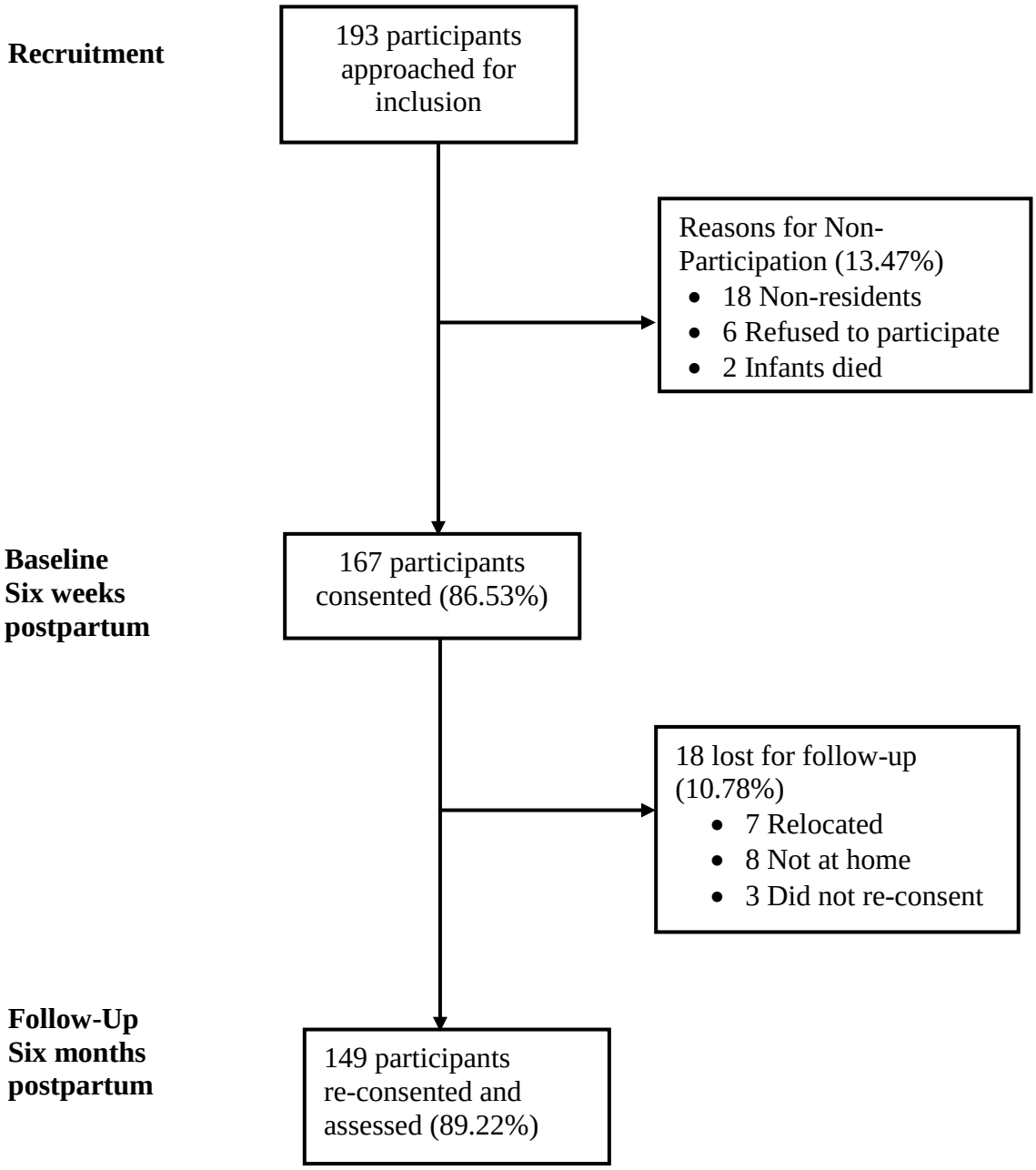

Figure 4.1. STROBE diagram showing recruitment, baseline and follow-up study points.

4.3 Baseline (Six Weeks Postpartum)

This section presents baseline findings in eight subsections: sociodemographic characteristics, poverty, prevalence, maternal mental illness and sociodemographic characteristics, maternal mental illness and infants' gender, maternal mental illness and infant growth, psychosocial factor and maternal mental illness and psychosocial factor and infant growth.

4.3.1 Maternal Sociodemographic Characteristics at Baseline

The study involved participants aged 18 to 42 years. Slightly more than one eighth of the participants were between the age of 18 and 19. While less than three-quarters (73.85%) of the participants were not married, while one-quarter were married. The majority of participants were of the Buganda tribe while close to two-thirds had an education level of primary and below. Close to half of the participants were Catholic by religion and less than one-quarter were Anglican. Nearly 90% of the participants were multiparous and slightly above 80% of the participants reported that they were exclusively breastfeeding (see Table 4.1).

Table 4.1
Participants' Characteristics at Baseline

Characteristics	n=167 (%)
Age	
18-19	27 (16.17)
20- 24	53 (31.74)
25-29	36 (21.56)
30-34	27 (16.17)
35+	24 (14.37)
Marital Status	
Married	42 (25.15)
Not Married	125(73.85)
Religious affiliation	
Catholic	79 (47.31)
Anglican	33 (19.76)
Others	55 (32.93)
Tribe	
Baganda	116 (69.46)
Banyarwanda	23 (13.77)
Other	28 (16.77)
Education	
Primary and below	107 (64.07)
Secondary and post-secondary	60 (35.93)
Planned Pregnancy	
Yes	96 (57.49)
No	71 (42.51)
Parity	
Primiparous	37 (22.16)
Multiparous	130 (87.84)
Exclusive Breastfeeding	
Yes	137 (82.63)
No	30 (17.37)

Note. n = number of participants

There were slightly more female babies than male babies (Table 4.2).

Table 4.2

Infants' Characteristics at Baseline

Characteristics	n=167 (%)
Gender	
Male	83 (49.70)
Female	84 (50.30)

Note. n = number of participants

4.3.2 Poverty in the Postpartum Period

Poverty was measured using an assets registry. A list of commonly owned household assets in rural Uganda was used. Slightly over 80% of the participants were living in houses built of bricks and roofed with iron sheets while slightly less than two-thirds owned the houses they were living in. More than three-quarters of the households owned a mobile phone while close to three-quarters of the participants owned a radio. Most of the participants (81.4 %) did not own a television set. Less than one-quarter of the participants were rearing at least one or more goats while slightly above one-quarter were rearing at least one or more pigs. Less than one-quarter of the participants were rearing chickens. Just over one-quarter of the participants owned a bicycle while an equal proportion owned a motorcycle.

Principle Component Analysis (PCA) was used to derive factor scores for the poverty index and the respondents were divided into quntiles (See Table N1 in Appendix N). Goat rearing had the highest factor score followed by type of house. The bicycle had the lowest scoring factor (Table 4.3). The factor scores where then used to group the households into quintiles to reflect the different poverty levels.

Table 4.3

Scoring Factors of Household Owing/Using Assets at Baseline

Asset index items	Distribution in the sample		Scoring factors
	Yes n (%)	No n (%)	
Type of house (brick and iron sheets)	139 (83.23)	28 (16.77)	.728
Mobile phone	134 (80.24)	33 (19.76)	.637
Radio	124 (74.25)	43 (25.75)	.606
Television	31 (18.56)	136 (81.44)	.486
Goats	28 (16.77)	139 (83.23)	.788
Pigs	48 (28.74)	119 (71.26)	.560
Chickens	32 (19.16)	135 (80.84)	-.747
Ownership of the house	104 (62.28)	63 (37.72)	.321
Bicycle	48 (28.74)	119 (71.26)	-.844
Motorcycle	36 (21.56)	131 (78.44)	-.398

Note. n = number of participants

4.3.3 Maternal Mental Illness Prevalence at Six Weeks Postpartum

Using the SCID as the gold standard, the prevalence for a major depressive episode was 34.73%, while 22.75% of the participants met the criteria AADA. The comorbidity rate for maternal depression and AADA was 16.17%.

On the EPDS, sixty-seven (40.12%) of the participants scored positive for depressive mood at the ≥13 cut-off while 40.72% of the participants were psychologically distressed on the SRQ 20 at the ≥6 cut-off (See Table N2 in Appendix N).

4.3.4 Maternal Mental Illness and Sociodemographic Characteristics at Six weeks

There was a significant association between maternal depression and marital status.There was no significant association between maternal depression and age, religious affiliation, tribe, education level, planned pregnancy, parity, and exclusive breastfeeding. However, there was a trend[3] towards association between maternal depression and planning for the pregancy. Participants who did not plan for the pregnancy had higher levels of depression than those who did (see Table 4.4).

[3] A trend is a *p* value that is greater than 0.05 and ranges from 0.056 to 0.099 (A. Field, 2013; Hankins, 2013). Trends signify direction of association but not essentially significancy.

Table 4.4
Maternal Characteristics and Maternal Depression at Baseline

Characteristics	Depressed n = 58 (%)	Not Depressed n = 109 (%)	X^2	*df*	OR	φ_c	95% CI	*P*
Age			4.34	4		.16	(.36-.38)	.363
18-19	11(18.97)	16 (14.68)						
20-24	16 (27.59)	37(33.94)						
25-29	12 (20.69)	24 (22.02)						
30-34	7 (12.07)	20 (18.35)						
35+	12 (20.69)	12(11.01)						
Marital Status			4.38	1		.16		.036
Married	9 (15.52)	33 (30.28)						
Not Married	49 (84.48)	76 (69.72)						
Religious Affiliation			1.72	4		.08	(.85-.86)	.788
Catholic	30 (51.72)	49 (44.95)						
Anglican	9 (15.52)	24 (22.02)						
Others	19 (32.76)	36 (33.03)						
Tribe			.68	2		.06	(.71-73	.725
Buganda	41(70.69)	75 (68.81)						
Banyarwanda	9 (15.52)	14 (12.84)						
Other	8 (13.79)	20 (18.35)						
Education			.388	1	1.24	.05		.842
Primary and less	39 (67.24)	68 (62.39)						
Secondary and post-secondary	19 (32.76)	41 (37.61)						
Planned Pregnancy			3.08	1	.56	.08		.079
Yes	28 (48.28)	68 (62.39)						
No	30 (51.72)	41 (37.61)						
Parity			.20	1	1.19	.04		.653
Primiparous	14 (24.14)	23 (21.10)						
Multiparous	44 (75.86)	86 (78.90)						
Exclusive Breastfeeding			.68	1	.71	.06		.408
Yes	46 (79.31)	92 (84.40)						
No	12 (20.69)	17 (15.60)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *P* = significance

Maternal AADA was not significantly associated with age, marital status, religious affiliation, tribe, education level, parity, planned pregnancy, parity or exclusive breastfeeding (See Table N3 in Appendix N).

The Bonferroni correction was used for multiple comparisons (A. Field, 2013), and a new alpha value was set at .006. The new value was obtained by dividing the original alpha level of 0.05 by eight (number of analyses) (see Table 4.5). When the Bonferroni correction was used, maternal psychological distress was associated with exclusive breastfeeding. There was a trend towards significance between maternal psychological distress and religious affiliation. Futhermore there was also a trend towards significance between maternal psychological distress and planning for preganancy. However, maternal age,marital status, tribe, education and parity were not associated with maternal psychological distress (see Table 4.5).

Table 4.5

Maternal Psychological Distress and Maternal Characteristics

Characteristics	Not Distressed n = 99 (%)	Distressed n = 68 (%)	X^2	*df*	OR	φ_c	95% CI	*P*
Age			4.34	4		.16	(.36-.38)	.372
18-19	12 (12.12)	15(22.06)						
20-24	33 (33.33)	20 (29.41)						
25-29	20 (20.20)	16 (23.53)						
30-34	17 (17.17)	10 (14.71)						
35+	17 (17.17)	7 (10.29)						
Marital Status			.582	1	1.33	.059		.445
Married	27 (30.28)	15 (15.52)						
Not Married	72 (69.72)	53 (84.48)						
Religious Affiliation			4.79	2		.17	(.09-.10)	.096
Catholic	40 (40.40)	39 (57.35)						
Anglican	23 (23.23)	10 (14.71)						
Others	36 (36.37)	19 (27.94)						
Tribe			3.23	2		.14	(.19-.21)	.200
Buganda	74 (74.75)	42 (61.76)						
Banyarwanda	11 (11.11)	12 (17.65)						
Other	14 (14.14)	14 (20.59)						
Education			.637	1	.768	.062		.425
Primary and less	61 (61.62)	46 (67.65)						
Secondary and post-secondary	38 (38.38)	35						
Planned Pregnancy			3.08	1	.56	.08		.079
Yes	68 (62.39)	28 (48.28)						
No	41 (37.61)	30 (51.72)						
Parity			.538	1	.76	.06		.463
Primiparous	20 (20.20)	17 (25.00)						
Multiparous	79 (78.90)	51 (75.00)						
Exclusive Breastfeeding			.63	1	2.88	.19		.010
Yes	88 (88.89)	50 (73.53)						
No	11 (11.11)	18 (26.47)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *p* = significance; Bonferroni correction = .006

4.3.5 Maternal Mental Illness and Infant's Gender

There was no significant association between infant's gender and maternal depression. There was no significant association between maternal AADA and gender of the infant. Furthermore, maternal psychological distress was not associated with infant's gender, nor was comorbidity associated with infant's gender (See Table N4 in Appendix N).

4.3.6 Maternal Mental Illness and Infant Growth

At six weeks postpartum, for HAZ, just over one-third of the infants were stunted (*M* = -2.86, *SD* =.86) while slightly below two-thirds of the infants had normal growth weight (*M* = -.50, *SD* = 1.05). For WAZ, 8% of the infants were underweight (*M* = -2.84, *SD* = .57) while slightly over 90% (*M* = -.07, *S* = .89) of the infants had normal growth weight. For WHZ, 2.41% of the infants were wasted (*M* = -2.84, *SD* = .57), while 14.46% were overweight (*M* = 2.66, *SD* = .51) and 83% were within normal growth weight limits (*M* = .47, *SD* = .51) (Table 4.6).

Table 4.6

Infant Growth at Six Weeks Postpartum

Variable	n=167 (%)	M	SD
Height for age Z-score (HAZ)			
Stunted[a]	64 (38.32)	-2.86	.86
Normal growth weight	103 (61.68)	-.50	1.05
Weight for age Z-score (WAZ)			
Underweight[a]	13 (7.78)	-2.84	.57
Normal growth weight	154(92.22)	-.07	.89
Weight for height Z-score (WHZ)			
Wasting[a]	4(2.40)	-2.40	.36
Normal growth	139(83.23)	.47	.87
Overweight	24(14.37)	2.66	.51

Note. n = number of participants; M = mean; SD = standard deviation; [a]Stunted/underweight/wasting is defined as a score at least 2 SD or more below the World Health Organization's standards.

There was no significant difference in infant growth (WAZ, HAZ and WHZ) for infants of depressed participants and those who were not. No significant association was found between infant growth (WAZ, HAZ and WHZ) and maternal AADA. Furthermore, there was no significant association between comorbidity and infant growth.

However, there was a significant difference in WAZ for participants with maternal psychological distress and those without. Infants of psychologically distressed participants had lower WAZ scores compared to those who were not. There was no significant difference in infant growth (HAZ and WHZ) among participants who were psychologically distressed and those who were not. However, there was a trend between maternal psychological distress and WHZ. Infants of distressed participants had lower WHZ scores compared to those whose mothers were not psychologically distressed (see Table 4.7).

Table 4.7

Maternal Psychological Distress and Infant Growth

	Distressed n = 68	Not Distressed n = 99	*t*	*df*	*MD*	η^2	95% CI	*p*
	M(SD)	M(SD)						
WAZ	-.50 (1.28)	-.13 (1.02)	2.08	165	.37	.026	(0.18-0.72)	.039
HAZ	-1.47 (1.52)	-1.34 (1.51)	.55	165	.13	.002	(-0.34 - 0.60)	.582
WHZ	.52 (1.30)	.85 (1.16)	1.69	165	.32	.017	(-0.03 - 0.71)	.093

Note. WAZ = weight for age Z-score; HAZ = height for age Z-score; WHZ = weight for height Z-score; n = number of participants; M = mean; SD = standard deviation; *df* = degrees of freedom; MD = mean difference; η^2 = eta squared; CI = confidence level; *p* = significance

4.3.7 Psychosocial Factors and Maternal Mental Illness

4.3.7.1 Poverty and Maternal Mental Illness

Participants' poverty and maternal depression were significantly associated. The lowest quintile had more depressed participants compared to the highest quintile. However, there was no significant association between maternal AADA and poverty. Furthermore, there was no significant association between maternal psychological distress and poverty (see Table 4.8).

Table 4.8

Poverty and Maternal Mental Illness

	Poverty Quintiles					X^2	*df*	φ_c	95% CI	*p*
	Lowest n=33 (%)	Second n=34 (%)	Middle n=34 (%)	Fourth n=34 (%)	Highest n=33 (%)					
Depressed	17 (29.31)	16 (27.59)	8 (13.79)	10 (17.24)	7 (12.07)	11.21	4	.26	(.02-.03)	.024
Not Depressed	16 (14.68)	18 (16.51)	26 (23.85)	23 (21.10)	26 (23.85)					
Anxious	10 (26.32)	11 (28.95)	6 (15.79)	6 (15.79)	5 (13.16)	4.83	4	.17	(.30-.32)	.305
Not Anxious	23 (17.83)	23 (17.83)	28 (21.71)	27 (20.93)	28 (21.71)					
Distressed	17 (25.00)	14 (20.59)	16 (23.53)	11 (16.17)	10 (14.71)	4.39	4	.16	(.35-.37)	.356
Not Distressed	16 (16.16)	20 (20.20)	18 (18.18)	22 (22.22)	23 (23.23)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *p* = significance

4.3.7.2 Relationship Discord and Maternal Mental Illness

There was a significant association between relationship discord and maternal mental illness (depression, anxiety, psychological distress and comorbidity). Mothers who experienced relationship discord at six weeks postpartum where more likely to be depressed, anxious, psychological distressed and have comorbidity of depression and anxiety (see Table 4.9).

Table 4.9

Association between Relationship Discord and Maternal Mental Illness

Maternal Mental Illness	Relationship Discord Levels		X^2	*df*	φ_c	95% CI	*p*
	Low n=145 (%)	High n=22 (%)					
Depression			4.39	1	.162		.036
Depressed	46 (31.72)	12 (54.55)					
Not Depressed	99 (68.28)	10 (45.45)					
Anxiety			7.43	1	.211		.006
Anxious	28 (19.31)	10 (45.45)					
Not Anxious	117 (80.69)	12 (54.55)					
Psychological Distress			21.87	1	.362		<.001
Distressed	49 (33.79)	17 (77.27)					
Not Distressed	96 (66.21)	5 (22.73)					
Comorbidity			8.59	2	.227	(.10-.14)	.012
Comorbid	19 (13.10)	8 (36.36)					
Either Depressed or Anxious	36 (24.83)	6 (27.27)					
Neither Depressed nor Anxious	90 (62.07)	8 (36.36)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *P* = significance

4.3.7.3 Social Support and Maternal Mental Illness

There was a significant association between social support and maternal depression. Depressed participants perceived that they had less social support compared to the non-depressed participants. Social support was also significantly associated with maternal psychological distress. The distressed participants received less social support compared to non-distressed participants. There was no association between social support and maternal comorbidity of depression and anxiety. Futhermore there was no significant association between social support and with AADA (see Table 4.10).

Table 4.10

Social Support and Maternal Mental Illness

Maternal Mental Illness	Social Support levels		X^2	*df*	φ_c	95% CI	*p*
	Low n=40 (%)	High n=127 (%)					
Depression			7.327	1	.209		.007
Depressed	21 (52.50)	37(29.13)					
Not Depressed	19 (47.50)	90 (70.87)					
AADA			.002	1	.003		.965
With AADA	9 (22.50)	29 (22.83)					
Without AADA	31 (77.50)	98 (77.17)					
Psychological Distress			4.444	1	.163		.035
Distressed	22 (55.00)	46 (36.22)					
Not Distressed	18(45.00)	81 (63.78)					
Comorbidity			4.19	2	.158	(.13-.14)	.133
Comorbid	8 (20.00)	19 (14.96)					
Either Depressed or Anxious	14 (35.00)	28 (22.05)					
Neither Depressed nor Anxious	18 (45.00)	80 (62.99)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *P* = significance

4.3.8 Psychosocial Factors and Infant Growth

There were no significant differences between poverty and infant growth (WAZ, HAZ, and WHZ). Furthermore, relationship discord and social support were not significantly related to infant growth (HAZ, WAZ, and WHZ) (See Table N5and N6 in Appendix N).

4.4 Follow-Up at Six Months Postpartum

This section focuses on follow-up results at six months postpartum and includes the following 10 subsections: sociodemographic characteristics, prevalence, maternal mental illness and sociodemographic characteristics, maternal mental illness and infant's gender, maternal mental illness and infant growth, maternal mental illness and psychomotor functioning, relationship between maternal mental illness at six weeks and maternal mental illness at six months, psychosocial factor and maternal mental illness, psychosocial factor and infant growth, and psychosocial factors and infant development. At six months postpartum, 149 participants with their babies were interviewed, and 18 participants were lost for follow-up (see Figure 4.2).

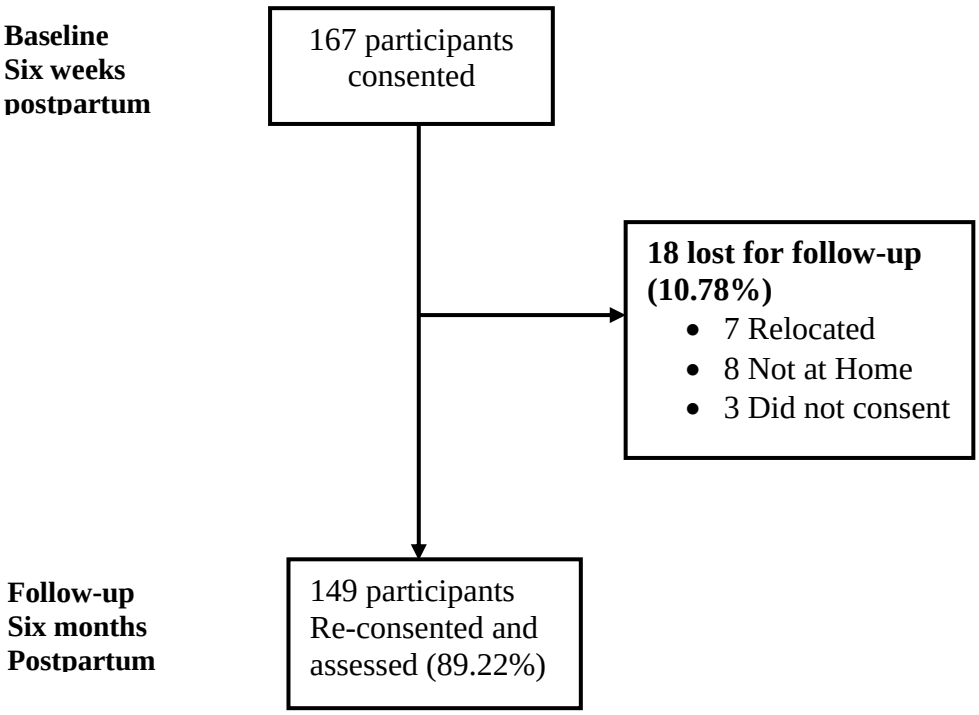

Figure 4.2. STROBE diagram showing the follow-up study point.

4.4.1 Sociodemographic Characteristics

At six months postpartum, slightly over half of the participants were exclusively breastfeeding (see Table 4.11).

Table 4.11

Participants' Characteristics at Six Months Postpartum

Characteristics	n=149 (%)
Age	
18-19	23 (15.44)
20- 24	44 (29.53)
25-29	32 (21.48)
30-34	26 (17.45)
35+	24 (16.17)
Marital Status	
Married	40 (26.85)
Not Married	109 (73.15)
Religious affiliation	
Catholic	68 (45.64)
Anglican	31 (20.81)
Others	50 (33.56)
Tribe	
Buganda	102 (68.46)
Banyarwanda	22 (14.77)
Other	25 (16.78)
Planned Pregnancy	
Yes	85 (57.00)
No	64 (43.00)
Education	
Primary and below	94 (63.09)
Secondary and post-secondary	55 (36.91)
Parity	
Primiparous	30 (20.13)
Multiparous	119 (79.89)
Exclusive Breastfeeding	
Yes	83 (55.70)
No	66 (44.30)

Note. n = number of participants

At six months postpartum, slightly over 50% of the infants were females (see Table 4.12).

Table 4.12

Infants' Gender at Six Months Postpartum

Gender	n=149 (%)
Male	74 (49.66)
Female	75 (50.34)

Note. n = number of participants

4.4.2 Maternal Mental Illness Prevalence at Six Months Postpartum

Using the SCID as the gold standard, at six months postpartum, 14.09% of the participants met the criteria for major depressive episode while 6.71% of the participants met the criteria for GAD. The comorbidity rate for maternal depression and maternal GAD during the follow-up period was 3.4%.

Thirty-three participants (22.15%) screened positive for depressed mood on EPDS using the ≥11 cut-off, while 23.49% of the participants were psychologically distressed on the SRQ-20 using the ≥6 cut-off (See Table N7 in Appendix N).

There was a significant association between the prevalence of maternal depression at six weeks and six months postpartum (See Table 4.13). However the prevalence of maternal anxiety at six week postpartum was not associated with the prevalence at six months postpartum (See Table N8 in Appendix N).

Table 4.13

Assosiation of Prevalence of Maternal Depression at Six Weeks and Six Months Postpartum

SCID-I-RV/NP Depression at Six Months Postpartum	SCID-I-RV/NP Depression at Six Weeks Postpartum		X^2	df	OR	φ_c	p
	Depressed n = 50 (%)	Not depressed n =99 (%)					
			3.885	1	.398	.161	.049
Not depressed	39 (78.00)	89 (89.90)					
Depressed	11 (22.00)	10 (10.10)					

4.4.3 Maternal Mental Illness at Six Months Postpartum and Sociodemographic Characteristics

There was no significant association between maternal depression and , marital status, religious affiliation, tribe, parity, planned pregnancy or exclusive breastfeeding. However, there was a trend between maternal depression and age. There was also a trend between maternal depression and tribe. More Baganda participants were depressed. Breastfeeding and maternal depression also showed a trend. There were more depressed non-breast-feeding participants than those who were breastfeeding (see Table 4.14).

Table 4.14

Maternal Characteristics and Maternal Depression at Six Months Postpartum

Characteristics	Depressed n = 21 (%)	Not Depressed n = 128 (%)	X^2	*df*	OR	φ_c	95% CI	*P*
Age			5.82	4		.246	(.05-.06)	.055
18-19	2 (9.52)	21 (16.4)						
20- 24	11(52.38)	33 (25.78)						
25-29	2 (9.52)	30(23.44)						
30-34	5 (23.81)	21 (16.41)						
35+	1 (4.76)	23 (17.97)						
Marital Status			1.964	1		.12		.161
Marrieds	3 (14.29)	37 (28.91)						
Non Marrieds	18 (85.71)	91.00 (71.09)						
Religious affiliation			1.42	2		.098	(.49-)	.506
Catholic	10 (47.62)	58 (45.31)						
Anglican	6 (28.57)	25 (19.53)						
Others	5 (23.81)	45 (35.16)						
Tribe			5.61	2		.061	(.77-.79)	.755
Baganda	15 (71.43)	87 (67.97)						
Banyankole		8 (6.25)						
Banyarwanda	2 (9.52)	20 (15.63)						
Other	4 (19.05)	21 (16.41)						
Education			.73	1	.65	.07		.393
Primary and below	15 (71.43)	79 (61.72)						
Secondary and post-secondary	6 (28.57)	49 (38.28)						
Planned pregnancy			2.01	1	1.95	.12		.156
Yes	9 (42.86)	76 (59.38)						
No	12 (57.14)	52 (40.63)						
Parity			1.08	1	.58	.09		.298
Primiparous	6 (28.57)	24 (18.75)						
Multiparous	15 (71.43)	104 (81.25)						
Exclusive Breastfeeding			3.07	1	2.30	.14		.080
Yes	8 (38.10)	75 (58.59)						
No	13 (61.90)	53 (41.41)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *P* = significance

Maternal GAD was not associated with age, marital status, religious affiliation, tribe, parity and planned pregnancy . However, there was a trend for maternal GAD and exclusive breastfeeding. In the anxious category, participants who did not breastfeed were more anxious than those who breastfed (see Table 4.15).

Table 4.15

Maternal Characteristics and GAD at Six Months Postpartum

Characteristics	Anxious n =10 (%)	Not Anxious n = 139 (%)	X^2	*df*	OR	φ_c	95% CI	*P*
Age			3.50	4		.15	(.50–.52)	.514
18-19	1 (10.00)	22 (15.83)						
20- 24	5 (50.00)	39 (28.06)						
25-29	2 (20.00)	30 (21.58)						
30-34	2 (20.00)	24 (17.27)						
35+	0 (.00)	24 (17.27)						
Marital Status			.994	1		.08		.331
Married	4 (40.00)	36 (25.90)						
Not Married	6 (60.00)	103 (74.10)						
Religious affiliation			0.88	2		.02	(.94–1.00)	.957
Catholic	5 (50.00)	63 (45.32)						
Anglican	2 (20.00)	29 (20.86)						
Others	3 (30.00)	47 (33.81)						
Tribe			2.09	2		.12	(.42-44)	.432
Baganda	6 (60.00)	96 (69.06)						
Banyarwanda	3 (30.00)	19 (13.67)						
Other	1 (10.00)	24 (17.27)						
Education			.04	1	1.15	.02		.834
Primary and below	6 (60.00)	88 (63.31)						
Secondary and post-secondary	4 (40.00)	50 (35.97)						
Planned Pregnancy			.734	1	.55	.07		.392
Yes	7 (70.00)	78 (56.12)						
No	3 (30.00)	61 (43.88)						
Parity			2.63	1	.35	.13		.105
Primiparous	4 (40.00)	26 (18.71)						
Multiparous	6 (60.00)	113 (81.29)						
Exclusive Breastfeeding			2.87	1	3.16	.14		.090
Yes	3 (30.00)	80 (57.55)						
No	7 (70.00)	59 (42.45)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c =Cramer's V; CI = confidence level; *P* = significance

The Bonferroni correction was used for multiple comparisons and a new alpha value was set at .006. Using the Bonferroni correction, maternal psychological distress at six months postpartum had a trend towards significance with unplanned pregnancy. Furthermore, maternal psychological distress was not significantly associated with maternal age, marital status, education level, religious affiliation, tribe, parity, or exclusive breastfeeding. Exclusive breastfeeding at six weeks postpartum was not associated with maternal depression, maternal GAD, maternal psychological distress or comorbidity at six months postpartum (see Table 4.16).

Table 4.16

Maternal Characteristics and Psychological Distress at Six Months Postpartum

Characteristics	Distressed n =35 (%)	Not Distressed n = 114 (%)	X^2	*df*	OR	φ_c	*95% CI*	*P*
Age			10.60	4		.27	(.30-.037)	.034
18-19	2 (5.71)	21 (18.42)						
20- 24	17 (48.57)	27 (23.68)						
25-29	4 (11.43)	20 (17.54)						
30-34	6 (17.14)	20 (17.54)						
35+	6 (17.14)	18 (15.79)						
Marital Status			.03	1	1.08	.01		.863
Married	9 (25.71)	31 (27.19)						
Not Married	26 (74.29)	83 (72.81)						
Religious Affiliation			.87	2		.08	(.65-.67)	.659
Catholic	16 (45.71)	52 (45.61)						
Anglican	9 (25.71)	22 (19.30)						
Others	10 (28.57)	40 (35.09)						
Tribe			1.629	2		.19	(.44-.46)	.453
Baganda	24 (68.57)	78 (68.42)						
Banyarwanda	7 (20.00)	15 (13.16)						
Other	4 (11.43)	21 (18.42)						
Education			.69	1	1.39	.07		.405
Primary level and less	20 (57.14)	74 (64.91)						
Secondary and post-secondary	15 (42.86)	40 (35.09)						
Planned pregnancy			7.40	1	2.90	.223		.007
Yes	13 (37.14)	72 (63.16)						
No	22 (62.86)	42 (36.84)						
Parity			.001	1	1.01	.00		.982
Primiparous	7 (20.00)	23 (20.18)						
Multiparous	28 (80.00)	91 (79.82)						
Exclusive Breastfeeding			.001	1	1.46	.08		.982
Yes	18 (51.43)	48 (42.11)						
No	17 (48.57)	66 (57.89)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *p* = significance; Bonferroni correction = .006

4.4.4 Maternal Mental Illness at Six Months Postpartum and Infant's Gender

At six months postpartum, there was no significant association between maternal depression, maternal GAD and gender of the infant. There was also no significant association between maternal psychological distress and gender of the infant (See Table N9 in Appendix N).

4.4.5 Maternal Mental Illness at Six Months Postpartum and Infant Growth

At six months postpartum, for HAZ, just over one-third of the infants were stunted (*M* = -2.66, *SD* .46) while slightly below two-thirds of the infants had normal growth weight (*M* = -1.03, *SD* = .88). For WAZ, 7.38% of the infants were underweight (*M* = -2.51, *SD* = .29) while slightly over 90% of the infants had normal growth weight (*M*= -.10, *S*=1.06). For WHZ, 2.01% of the infants were wasted (*M* =-2.23, *SD* = .23) while slightly below one-third were overweight (*M* =2.67, *SD* = .55) and more than half were within normal limits (*M* = .557, *SD* = .85) (see Table 4.17).

Table 4.17

Infant Growth at Six Months Postpartum

Variable	n=149 (%)	M	SD
Height for Age (HAZ)			
Stunted[a]	54 (36.24)	-2.66	.46
Normal growth	95 (63.76)	-1.03	.88
Weight for Age (WAZ)			
Underweight[a]	11 (7.38)	-2.51	.29
Normal growth weight	138 (92.62)	-.10	1.06
Weight for Height (WHZ)			
Wasting[a]	3 (2.01)	-2.23	.23
Normal growth weight	98 (65.77)	.557	.85
Overweight	48 (32.21)	2.67	.55

Note. N = number of participants; M = mean; SD = standard deviation. [a]Stunted/underweight/wasting is defined as a score of -2 SD or more below the World Health Organization's standards.

There was a significant difference in WAZ and WHZ for infants whose mothers were depressed and those whose mothers were not depressed. Infants of depressed participants had lower WAZ and WHZ scores compared to infants whose mothers were not depressed. However, there was no significant difference in HAZ for infants whose mothers were depressed and those whose mothers were not depressed (see Table 4.18).

Table 4.18

Maternal Depression at Six Months Postpartum and Infant Growth

	Depression n = 21	Not Depressed n = 128	t	*df*	MD	η^2	95% CI	*p*
	M (SD)	M (SD)						
WAZ	-.95 (1.52)	-.18 (1.15)	2.72	147	.77	.048	(.21-1.33)	.007
HAZ	-1.81 (.65)	-1.58 (1.15)	.89	147	.23	.001	(-.27-.74)	.376
WHZ	.60 (1.53)	1.28 (1.28)	2.17	147	.67	.031	(.06-1.29)	.032

Note. WAZ = weight for age Z-score; HAZ = height for age Z-score; WHZ = weight for height Z-score; n = number of participants; M = mean; SD = standard deviation; *df* = degrees of freedom; MD = mean difference; η^2 = eta squared; CI = confidence level; *p* = significance

Infant growth (WAZ, HAZ and WHZ) was not significantly associated with maternal GAD. Furthermore, there was no significant difference in WAZ, HAZ and WHZ for infants whose mothers were psychologically distressed and those whose mothers were not. Infant growth was not significantly associated with maternal comorbidity of depression and GAD. However, there was a trend for WAZ and comorbidity. Infants of mothers who had both depression and GAD had lower WAZ scores (see Table 4.19).

Table 4.19

Comorbidity at Six Months Postpartum and Infant Growth

	Comorbid n = 5	Only Depressed n = 16	Only Anxious n = 5	Neither Depressed nor Anxious n = 123	*df*	η^2	F	*p*
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*				
WAZ	-1.07 (1.75)	-.91 (1.50)	-.26 (.53)	-.18 (1.17)	3	.048	2.46	.065
HAZ	-1.45 (.67)	-1.93 (.62)	-1.94 (.36)	-1.57 (1.17)	3	.014	.69	.561
WHZ	.05 (1.67)	.78 (1.50)	1.5 (.38)	1.27 (1.31)	3	.040	2.00	.116

Note. WAZ = weight for age Z-score; HAZ = height for age Z-score; WHZ = weight for height Z-score; *M* = mean *SD* = standard deviation; *df* = degrees of freedom; η^2=Eta squared; *p* = significance

Exclusive breastfeeding at six weeks postpartum was associated with WAZ and WHZ at six months postpartum. Infants who were exclusively breastfed at six weeks postpartum had higher scores on WAZ and WZH at six months postpartum. There was no significant association between exclusive breastfeeding at six weeks postpartum and HAZ at six months postpartum (see Table 4.20).

Table 4.20

Exclusive Breastfeeding at Six Weeks Postpartum and Infant Growth at Six Months Postpartum

	Exclusive Breastfeeding at Six Weeks Postpartum		t	*df*	MD	η^2	95% CI	*p*
	Yes M (SD)	No M (SD)						
WAZ	-.18 (1.25)	-.84 (1.00)	2.43	147	.66	0.039	(.12-1.18)	.016
HAZ	-1.56 (1.09)	-1.93 (1.03)	1.52	147	.37	0.016	(-.11-.85)	.130
WHZ	1.28 (1.36)	.68 (1.12)	2.03	147	.60	0.027	(.02-1.18)	.044

Note. WAZ = weight for age Z-score; HAZ = height for age Z-score; WHZ = weight for height Z-score; M = mean; SD = standard deviation; *df* = degrees of freedom; MD = mean difference; η^2 = eta squared; CI = confidence level; *p* = significance

Maternal mental illness at six weeks postpartum was analysed against infant growth at six months postpartum. Maternal depression, maternal AADA and maternal psychological distress at six weeks postpartum were not significantly associated with WAZ, HAZ or WHZ at six months postpartum. Furthermore, comorbidity at six weeks postpartum was not significantly associated with WAZ, HAZ or WHZ at six months postpartum.

4.4.6 Maternal Mental Illness at Six Months Postpartum and Psychomotor Functioning

This section presents results on maternal mental illness and psychomotor functioning of the infants. Psychomotor functioning was measured at six months postpartum using two scales: KDI and DMC.

4.4.6.1 Maternal Mental Illness at Six Months Postpartum and the Kilifi Developmental Inventory

There was no significant difference in psychomotor functioning between infants of mothers who were depressed, anxious or distressed and those whose mothers were not. Furthermore, the subscales of infant fine motor development and locomotor development were not significantly associated with maternal depression, maternal GAD or maternal psychological distress. There was no significant difference in psychomotor functioning, fine motor functioning or locomotor functioning among infants of comorbid mothers and those whose mothers were not experiencing comorbid maternal depression and AADA.

Maternal depression, maternal AADA, psychological distress and comorbidity at six weeks postpartum were not significantly associated with psychomotor function, locomotor functioning or fine motor functioning on the KDI at six months postpartum. Exclusive breastfeeding at six weeks postpartum was not significantly associated with psychomotor

function, locomotor functioning or fine motor functioning on the KDI at six months postpartum.

4.4.6.2 Maternal Mental Illness at Six Months Postpartum and the Developmental Milestones Checklist

There was no significant difference in fine motor skills and locomotor skills for infants of depressed, anxious or distressed mothers and those whose mothers were not. However, there was a trend for maternal depression and fine motor functioning. Infants of depressed mothers had lower scores compared to those whose mothers were not depressed (see Table 4.21).

Table 4.21

Maternal Mental Illness at Six Months Postpartum and Fine Motor Functioning

	n=149 (%)	M	SD	t	df	MD	η^2	95% CI	*p*
Not Depressed	128(85.91)	8.81	1.86	1.93	147	.86	.025	(-.02-1.74)	.055
Depressed	21(14.09)	7.95	2.06						
Not Anxious	139(93.29)	8.76	1.89	1.54	147	.96	.016	(-.27-2.18)	.126
Anxious	10(6.71)	7.80	2.04						
Not distressed	114(76.51)	8.82	1.87	1.44	147	.53	.014	(-.20-1.26)	.151
Distressed	35(23.49)	8.29	1.99						

Note. N = number of participants; M = mean; SD = standard deviation; *df* = degrees of freedom; MD = mean difference; η^2 = eta squared; CI = confidence level; *p* = significance

There was no significant difference in language development for infants of anxious or distressed participants and those who were not. However, there was a trend for depression and language development. Infants of depressed participants had lower scores for language development compared to those who were not depressed (see Table 4.22).

Table 4.22

Maternal Mental Illness at Six Months Postpartum and Language Development

	n=149 (%)	M	SD	t	df	MD	η^2	95% CI	*p*
Not Depressed	128(85.91)	4.25	1.18	1.93	147	.54	.025	(-.01-1.08)	.056
Depressed	21(14.09)	3.71	1.15						
Not Anxious	139 (93.29)	4.19	1.22	.75	147	.29	.004	(-.48-1.07)	.452
Anxious	10(6.71)	3.90	.74						
Not Distressed	114 (76.51)	4.24	1.23	1.15	147	.27	.009	(-.19-.72)	.250
Distressed	35 (23.49)	3.97	1.04						

Note. N = number of participants; M = mean; SD = standard deviation; *df* = degrees of freedom; MD = mean difference; η^2 = eta squared; CI = confidence level; *p* = significance

There was no significant difference in psychomotor functioning or the personal and social development subscale for infants of depressed, anxious or distressed participants and those who were not. Comorbidity was not significantly associated with infants' locomotor functioning, fine motor functioning, psychomotor functioning, language development or personal and social development. However, there was a trend for comorbidity and language development. Infants of mothers with comorbid maternal depression and AADA had lower scores in language development compared to those who did not experience comorbid maternal depression and AADA (see Table 4.23).

Table 4.23

Comorbidity at Six Months Postpartum and Developmental Milestones Checklist

Developmental Milestones Checklist Scales	Comorbid n=5 M (SD)	Only Depressed n=16 M (SD)	Only Anxious n=5 M (SD)	Neither Depressed nor Anxious n=123 M (SD)	*df*	η^2	F	*p*
Locomotor functioning	12.40 (.55)	12.81 (1.11)	12.60 (.55)	12.68 (1.49)	3	.002	.12	.950
Fine motor functioning	7.40 (1.82)	8.13 (2.16)	8.20 (2.39)	8.84 (1.84)	3	.032	1.61	.190
Language functioning	4.20 (.45)	3.56 (1.26)	3.60 (.89)	4.28 (1.19)	3	.043	2.15	.096
Personal and social functioning	22.40 (1.14)	22.25 (3.38)	25.60 (4.51)	23.39 (4.70)	3	.016	.81	.493
Psychomotor functioning	19.80 (2.17)	20.94 (2.98)	20.80 (2.86)	21.52 (2.62)	3	.019	.94	.426

Note. n = number of participants; M = mean; SD = standard deviation; *df* = degrees of freedom; η^2 = eta squared; *p* = significance

Maternal depression at six weeks postpartum was associated with language development at six months postpartum. Infants of mothers who were not depressed at six weeks postpartum scored higher on language development than those whose mothers were depressed. However, maternal depression at six weeks postpartum was not significantly associated with infant psychomotor functioning, locomotor functioning, fine motor functioning, language development or personal and social functioning at six months postpartum (see Table 4.24). Furthermore, maternal AADA at six weeks postpartum was not significantly associated with infant psychomotor function, locomotor functioning, fine motor functioning, language development or personal and social functioning at six months postpartum.

Table 4.24

Maternal Depression at Six Weeks Postpartum and Infant Psychomotor Functioning – Developmental Milestones Checklist at Six Months Postpartum

	Depression at Six Weeks Postpartum							
Developmental Milestones Checklist Scales	Not Depressed M (SD)	Depressed M (SD)	t	Df	MD	η^2	95% CI	*p*
Locomotor	12.73 (1.43)	12.60 (1.36)	.52	147	.13	.002	(-.61-36)	.603
Fine motor	8.71 (1.95)	8.66(1.84)	.14	147	.05	< .001	(-.70-.61)	.887
Language	4.32 (1.23)	3.88 (1.06)	2.17	147	.44	.031	(.04-.84)	.031
Personal and social	23.12 (4.94)	23.68 (3.48)	.71	147	.56	.003	(-.99-2.10)	.476
Psychomotor	48.84(6.81)	48.82(4.96)	.02	146	.02	< .001	(-2.17-2.13)	.988

Note. M = mean; SD = standard deviation; *df* = degrees of freedom; MD= Mean Difference; η^2=Eta squared; CI = confidence level; *p*= significance

Maternal psychological distress at six weeks postpartum was associated with infant language development at six months postpartum. Infants of mothers who were

psychologically distressed at six weeks postpartum had lower language development scores than those whose mothers were not psychologically distressed. Maternal psychological distress at six weeks postpartum was not significantly associated with infant psychomotor function, locomotor functioning, fine motor functioning or personal and social functioning at six months postpartum (see Table 4.25).

Table 4.25

Maternal Psychological Distress at Six Weeks Postpartum and Infant Psychomotor Development – Developmental Milestones Checklist at Six Months Postpartum

	Maternal Psychological Distress at Six Weeks Postpartum		t	df	MD	η^2	95% CI	*p*
Developmental Milestones Checklist Scales	Not Distressed M (SD)	Distressed M (SD)						
Locomotor	12.66 (1.33)	12.72 (1.53)	.27	147	.07	< .001	(-.53-.40)	.785
Fine motor	8.84 (1.75)	8.47 (2.12)	1.16	147	.37	.009	(-.26-1.00)	.250
Language	4.40 (1.17)	3.83 (1.14)	2.91	147	.57	.054	(.18-.95)	.004
Personal and social	23.41 (4.87)	23.16 (3.89)	.33	147	.25	.001	(-1.25-1.75)	.741
Psychomotor	49.25 (6.49)	48.17 (5.81)	1.06	146	1.08	.008	(-.99-3.15)	.304

Note. M = mean; SD = standard deviation; *df* = degrees of freedom; MD = mean difference; η^2 = eta squared; CI = confidence level; *p* = significance

Comorbidity at six weeks postpartum was not significantly associated with infant psychomotor function, locomotor functioning, fine motor functioning, language development or personal and social functioning at six months postpartum. There was a trend between comorbidity and infant locomotor functioning (see Table 4.26).

Table 4.26

Maternal Comorbidity at Six Weeks Postpartum and Infant Psychomotor Functioning – Developmental Milestones Checklist at Six Months Postpartum

Developmental Milestones Checklist Scales	Comorbidity at Six Weeks Postpartum				*df*	η^2	F	*p*
	Comorbid	Only Depressed	Only Anxious	Neither Depressed nor Anxious				
	M (SD)	M (SD)	M (SD)	M (SD)				
Locomotor	12.27 (1.55)	12.86 (1.15)	13.75 (2.31)	12.64 (1.31)	3	.05	2.41	.07
Fine motor	8.82 (2.04)	8.54 (1.69)	9.25 (2.60)	8.66 (1.89)	3	.01	.33	.81
Language	3.86 (1.32)	3.89 (.83)	4.5 (.93)	4.31(1.25)	3	.03	1.62	.19
Personal and social	24.86 (3.43)	22.75 (3.30)	20.5 (8.64)	23.35 (4.49)	3	.04	2.11	.10
Psychomotor	49.82 (5.20)	48.04 (4.70)	48 (12.25)	48.91 (6.23)	3	.01	.38	.77

Note. M = mean; SD = standard deviation; *df* = degrees of freedom; η^2 = eta squared; *p* = significance

Exclusive breastfeeding at six weeks postpartum was not significantly associated with infant psychomotor function, locomotor functioning, fine motor functioning, language development or personal and social functioning at six months postpartum.

4.4.7 Maternal Mental Illness at Six Weeks and Six Months Postpartum

Maternal depression at six weeks postpartum was associated with maternal depression at six months postpartum. Slightly over half of the participants who were depressed at six weeks were still depressed at six months postpartum. Additionally, there was a trend between maternal depression at six weeks postpartum and maternal psychological distress at six months postpartum. Almost half of the participants who were depressed at six weeks were psychologically distressed at six months postpartum. However, maternal depression at six weeks postpartum was not significantly associated with maternal GAD and comorbidity at six months postpartum (see Table 4.27).

Table 4.27

Maternal Depression at Six Weeks Postpartum and Maternal Mental Illness at Six Months Postpartum

	Maternal Depression at Six Weeks Postpartum							
Maternal Mental Illness at Six Months Postpartum	Depressed n=50 (%)	Not Depressed n=99 (%)	X^2	*df*	OR	φ_c	95% CI	*p*
Depression			3.89	1	.40	.161		.049
Depressed	11 (52.38)	10 (47.62)						
Not Depressed	39 (30.47)	89 (69.53)						
Psychological Distress			3.03	1	.505	.143		.082
Distressed	16 (45.71)	19 (54.29)						
Not Distressed	34 (29.82)	80 (70.18)						
Maternal GAD			1.30	1	.479	.093		.254
Anxious	5 (50.00)	5 (50.00)						
Not Anxious	45 (32.37)	94 (67.63)						
Comorbidity			4.27	3		.169	(.23-.25)	.234
Comorbid	3 (60.00)	2 (40.00)						
Only depressed	8 (50.00)	8 (50.00)						
Only anxious	2 (40.00)	3 (60.00)						
Neither depressed nor anxious	37 (30.08)	86 (69.92)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *p* = significance

Maternal AADA at six weeks postpartum was associated with maternal depression at six months postpartum. Over one-quarter of the participants who were anxious at six weeks postpartum were depressed at six months. Maternal AADA at six weeks postpartum was not significantly associated with maternal GAD, maternal psychological distress or comorbidity at six months postpartum (see Table 4.28).

Table 4.28

Maternal AADA *at Six Weeks Postpartum and Maternal Mental Illness at Six Months Postpartum*

	AADA at Six Weeks Postpartum						
Maternal Mental Illness at Six Months Postpartum	Not Anxious n = 119 (%)	Anxious n = 30 (%)	X^2	*df*	OR	φ_c	*p*
Depression			4.90	1	2.96	.181	.027
Not Depressed	106 (82.81)	22 (17.19)					
Depressed	13 (61.90)	8 (38.10)					
Psychological Distress			2.03	1	1.88	.117	.155
Not Distressed	94 (82.46)	20 (17.54)					
Distressed	25 (71.43)	10 (28.57)					
Maternal GAD			.00	1	.001	.991	.991
Not Anxious	111 (79.86)	28 (20.14)					
Anxious	8 (80.00)	2 (20.00)					
Comorbidity			5.88	3		.199	.118
Comorbid	3 (60.00)	2 (40.00)					
Only depressed	10 (62.50)	6 (37.50)					
Only anxious	5 (100.00)	0 (.00)					
Neither depressed nor anxious	101 (82.11)	22 (17.89)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; *P* = significance

Maternal psychological distress at six weeks postpartum was associated with maternal depression at six months postpartum. More than three-quarters of participants who were depressed at six months postpartum had experienced maternal psychological distress at six weeks. Additionally, maternal psychological distress at six weeks postpartum was associated with maternal GAD at six months postpartum. Over three-quarters of the participants who were distressed at six weeks were anxious at six months. Maternal psychological distress at six weeks postpartum was associated with maternal psychological distress at six months postpartum. More than half of participants who were distressed at six months postpartum had also experienced maternal psychological distress at six weeks. Maternal psychological distress at six weeks postpartum was associated with comorbidity at six months postpartum. Over three-quarters of the participants who were distressed at six weeks were comorbid at six months postpartum (see Table 4.29).

Table 4.29

Maternal Psychological Distress at Six Weeks Postpartum and Maternal Mental Illness at Six Months Postpartum

Maternal Mental Illness at Six Months Postpartum	Maternal Psychological Distress at Six Weeks Postpartum		X^2	*df*	OR	φ_c	95% CI	*p*
	Not Distressed n = 91 (%)	Distressed n =58 (%)						
Depression			18.16	1	9.02	.35		< .001
Not depressed	87 (95.60)	41 (70.69)						
Depressed	4 (4.40)	17 (29.31)						
Psychological Distress			11.02	1	3.67	.27		< .001
Not distressed	78 (85.71)	36 (62.07)						
Distressed	13 (14.29)	22 (37.93)						
Maternal GAD			7.61	1	7.12	.23		.006
Not anxious	89 (97.80)	50 (86.21)						
Anxious	2 (2.20)	8 (13.79)						
Comorbidity			23.20	3		.40	(.00-.03)	< .001
Comorbid	1 (1.10)	4 (6.90)						
Only depressed	3 (3.30)	13 (22.41)						
Only anxious	1 (1.10)	4 (6.90)						
Neither depressed nor anxious	86 (94.51)	37 (63.79)						

Note. GAD = generalised anxiety disorder; n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *P* = significance

There was a trend between comorbidity at six weeks postpartum and maternal depression at six months postpartum. Slightly more than one-quarter of those who were depressed at six months postpartum had been comorbid at six weeks postpartum. Furthermore, comorbidity at six weeks postpartum was not significantly associated with maternal GAD, maternal psychological distress or comorbidity at six months postpartum (see Table 4.30).

Table 4.30

Maternal Comorbidity at Six Weeks Postpartum and Maternal Mental Illness at Six Months Postpartum

Maternal Mental Illness at Six Months Postpartum	Comorbidity at Six Weeks Postpartum				X^2	df	φ_c	95% CI	*p*
	Comorbid	Only Depressed	Only Anxious	Neither Depressed nor Anxious					
Depression									
Not depressed	16 (12.50)	23 (17.97)	6 (4.69)	83 (64.84)	6.38	3	.207	(.09-.10)	.094
Depressed	6 (28.57)	5 (23.81)	2 (9.52)	8 (38.10)					
Psychological Distress					3.61	3	.156	(.31-.33)	.307
Not distressed	14 (12.28)	20 (17.54)	6 (5.26)	74 (64.91)					
Distressed	8 (22.86)	8 (22.80)	2 (5.71)	17 (48.57)					
Maternal GAD					3.94	3	.163	(.27-.28)	.268
Not anxious	21 (15.11)	24 (17.27)	7 (5.04)	87 (62.59)					
Anxious	1 (10.00)	4 (40.00)	1 (10.00)	4 (40.00)					
Comorbidity					11.45	9	.160	(.21-.23)	.246
Comorbid	1 (20.00)	2 (40.00)	1 (20.00)	1 (20.00)					
Only depressed	5 (31.25)	3 (18.75)	1 (6.25)	7 (43.75)					
Only anxious	0 (.00)	2 (40.00)	0 (.00)	3 (60.00)					
Neither depressed nor anxious	16 (13.01)	21 (17.07)	6 (4.88)	80 (65.04)					

Note. GAD = generalised anxiety disorder; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *p* = significance

4.4.8 Psychosocial Factors and Maternal Mental Illness at Six Months Postpartum

There was a significant association between poverty and maternal psychological distress. The lowest, second and middle quintiles had more distressed participants compared to the fourth and highest quintile combined. In the non-distressed category, the reverse was true. However, poverty was not significantly associated with maternal depression or maternal GAD (see Table 4.31).

Table 4.31

Poverty and Maternal Mental Illness at Six Months Postpartum

	Poverty Quintiles					X^2	*df*	φ_c	*95% CI*	*p*
	Lowest n=28 (%)	Second n=33 (%)	Middle n=30 (%)	Fourth n=28 (%)	Highest n=31 (%)					
Not Depressed	24 (18.75)	27 (21.09)	24 (18.75)	23 (17.97)	30 (23.44)	4.27	4	.17	(.37-.39)	.370
Depressed	4 (19.05)	5 (23.81)	6 (28.57)	5 (23.81)	1 (4.76)					
Not Anxious	27 (19.42)	29 (20.86)	26 (18.71)	27 (19.42)	30 (21.58)	3.94	4	.16	(.41-.43)	.413
Anxious	1 (10.00)	3 (30.00)	4 (40.00)	1 (10.00)	1 (10.00)					
Not Distressed	22 (19.30)	25 (21.93)	17 (14.91)	21 (18.42)	29 (25.44)	11.73	4	.28	(.02-.02)	.019
Distressed	6 (17.14)	7 (20.00)	13 (37.14)	7 (20.00)	2 (5.71)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *p* = significance

There was a trend for the association between relationship discord at six weeks postpartum and depression at six months postpartum. There was also a trend for association between relationship discord at six weeks postpartum and comorbidity of depression and anxiety at six months postpartum. However, relationship discord at six weeks postpartum was not significantly associated with maternal GAD at six months postpartum. Relationship discord at six weeks postpartum was also not significantly associated with maternal psychological distress (see Table 4.32).

Table 4.32

Relationship Discord at Six Weeks Postpartum and Maternal Mental Illness at Six Months Postpartum

Maternal Mental Illness at 6 Months	Relationship Discord Levels at 6 weeks			X^2	*df*	φ_c	95% CI	*p*
	Low (8-12) n (%)	Medium (13-17) n (%)	High (18-24) n (%)					
Depression				5.132	2	.186	(.066-.076)	.071
Depressed	7 (33.33)	11 (52.38)	3 (14.29)					
Not Depressed	76 (59.38)	43 (33.59)	9 (7.03)					
Anxiety				.155	2	.032	(.862-1.00)	.926
Anxious	5 (50.00)	4 (40.00)	1 (10.00)					
Not Anxious	78 (56.12)	50 (35.97)	11 (7.91)					
Psychological Distress				2.019	2		(.357-.376)	.364
Distressed	16 (45.71)	15 (42.86)	4 (11.43)					
Not Distressed	67 (58.77)	39 (34.21)	8 (7.02)					
Comorbidity				11.490	6	.196	(.074-.084)	.079
Comorbid	1 (20.00)	4 (80.00)	0 (.00)					
Only Depressed	6 (37.50)	7 (43.75)	3 (18.75)					
Only Anxious	4 (80.00)	0 (0.0)	1 (20.00)					
Neither Depressed nor Anxious	72 (58.54)	43 (34.96)	8 (6.50)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *P* = significance

There was a significant association between relationship discord at six months postpartum and depression. Depressed participants experienced more relationship discord than participants who were not. Furthermore, there was a significant association between relationship discord at six months and maternal psychological distress. Participants who were distressed experienced more relationship discord than those who were not distressed. There was also a significant association between relationship discord at six months and comorbidity of maternal depression and maternal GAD. Participants who had comorbidity of depression and GAD experienced more relationship discord than those who did not. However, there was no significant association between relationship discord at six months and maternal GAD (see Table 4.33).

Table 4.33

Relationship Discord at Six Months and Maternal Mental Illness at Six Months Postpartum

Maternal Mental illness	Relationship Discord Levels			X^2	*df*	φ_c	95% CI	*p*
	Low (8-12) n (%)	Medium (13-17) n (%)	High (18-24) n (%)					
Depression				24.50	2	.406	(.000-.000)	<.001
Depressed	5 (23.81)	7 (33.33)	9 (42.86)					
Not Depressed	90 (73.17)	28 (22.76)	10 (8.13)					
Anxiety				2.88	2	.139	(.250-.267)	.238
Anxious	5 (50.00)	2 (20.00)	3 (30.00)					
Not Anxious	90 (64.75)	33 (23.74)	16 (11.51)					
Psychological Distress				18.84	2	.356	(.000-.000)	<.001
Distressed	12 (34.29)	13 (37.14)	10 (28.57)					
Not Distressed	83 (72.81)	22 (19.30)	9 (7.89)					
Comorbidity				30.45	6	.320	(.000-.000)	<.001
Comorbid	2 (40.00)	0 (.00)	3 (60.00)					
Only Depressed	3 (18.75)	7 (43.75)	6 (37.50)					
Only Anxious	3 (60.00)	2(40.00)	0 (.00)					
Neither Depressed nor Anxious	87 (70.73)	26 (21.14)	10 (8.13)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *P* = significance

Social support at six weeks postpartum was not significantly associated with maternal depression, maternal GAD or maternal psychological distress at six months postpartum. There was no significant association between social support and maternal depression, maternal GAD, maternal psychological distress and comorbidity of maternal depression and maternal GAD (See Table N10 and N11 in Appendix N).

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4.4.9 Psychosocial Factors and Infant Growth at Six Months Postpartum

There was no significant association between poverty and infant growth (WAZ, HAZ and WHZ). Relationship discord and social support were not significantly related to infant growth (HAZ, WAZ and WHZ). Furthermore, poverty, relationship discord and social support at six weeks postpartum were not significantly associated with WAZ, HAZ or WHZ at six months postpartum (See Table N12 and N13 in Appendix N).

4.4.10 Psychosocial Factors and Psychomotor Functioning at Six Months Postpartum

There was no significant relationship between poverty and psychomotor functioning on either KDI or DMC. However, there was a trend for poverty and psychomotor development on both KDI and DMC. On the KDI, infants of mothers in the lowest quintile had a lower mean on psychomotor development compared to other quintiles, while on the DMC; infants of mothers in the second quintile had the lowest mean in psychomotor development (see Table 4.34).

Table 4.34

Poverty and Psychomotor Functioning

	Poverty Quintiles								
	Lowest n=28	Second n=32	Middle n=30	Fourth n=28	Highest n=31	*df*	η^2	F	*p*
Psychomotor Functioning	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)				
Psychomotor Functioning (KDI)	17.21 (5.34)	19.28 (3.60)	19.67 (2.55)	17.29 (5.42)	18.45 (3.63)	4	.055	2.08	.087
Psychomotor Functioning (DMC)	20.71 (3.12)	20.54 (2.81)	21.77 (2.08)	22.16 (2.19)	21.64 (2.72)	4	.057	2.19	.073

Note. KDI = Kilifi Developmental Inventory; DMC = Developmental Milestones Checklist; n = number of participants; M = mean; SD = standard deviation; *df* = degrees of freedom; η^2 = eta squared; *p* = significance

Results from the DMC showed a strong positive correlation between psychomotor functioning and social support. High levels of social support were associated with psychomotor functioning on the DMC. However, there was no significant relationship between psychomotor functioning and relationship discord. KDI results showed no significant relationship between psychomotor functioning and relationship discord or social support (see Table 4.35).

Table 4.35

Correlation Coefficients between Relationship Discord, Social Support at Six Months Postpartum and Psychomotor Functioning

	1.	2.	3.	4.
1. Psychomotor Functioning (KDI)	-	.118	.091	.273**
2. Social Support		-	-.265**	.183*
3. Relationship Discord			-	.005
4. Psychomotor Functioning (DMC)				-

Note. KDI = Kilifi Developmental Inventory; DMC = Developmental Milestones Checklist
** Significant at the .01 level (2-tailed)
* Significant at the .05 level (2-tailed)

Social support at six weeks postpartum was not significantly associated with psychomotor function, locomotor functioning or fine motor functioning on the KDI at six months postpartum. Furthermore, on the DMC, social support at six weeks postpartum was not significantly associated with psychomotor function, locomotor functioning, fine motor functioning, language development or personal and social functioning at six months postpartum.

Relationship discord at six weeks postpartum was negatively related with locomotor functioning on the KDI at six months postpartum. The higher the levels of relationship discord, the lower the infants scored on locomotor functioning. However, relationship discord was not significantly associated with psychomotor function or fine motor functioning on the KDI at six months postpartum. On the DMC, relationship discord at six weeks postpartum was negatively correlated with language development at six months postpartum. The higher the levels of relationship discord, the lower the infants scored on language development. However, relationship discord was not significantly associated with psychomotor function, locomotor functioning, fine motor functioning or personal and social functioning at six months postpartum (see Table 4.36).

Table 4.36

Relationship Discord at Six Weeks Postpartum and Psychomotor Functioning at Six Months Postpartum

	1	2	3	4	5	6	7	8	9
1. Relationship Discord	-	-.059	-.194*	.020	-.070	-.040	-.069	-.179*	-.002
2. Psychomotor Functioning-KDI		-	.705**	.936**	.273**	.256**	.347**	-.061	.169*
3. Locomotor-KDI			-	.411**	.382**	.297**	.351**	.077	.267**
4. Fine Motor-KDI				-	.161*	.181*	.273**	-.117	.084
5. Psychomotor Functioning-DMC					-	.445**	.598**	.407**	.882**
6. Locomotor-DMC						-	.264**	.118	.161
7. Fine Motor-DMC							-	.164*	.280**
8. Language-DMC								-	.190*
9. Personal and social-DMC									-

Note. KDI = Kilifi Developmental Inventory; DMC = Developmental Milestones Checklist
** Significant at the 0.01 level (2-tailed)
* Significant at the 0.05 level (2-tailed)

4.5 Effectiveness of Screening Tools for Depression

The ROC analysis was run for the EPDS and SRQ-20 using the SCID as a gold standard for diagnosis. The purpose of running the Receiver operating characteristics (ROC) curves analysis was to establish the overall accuracy of the EPDS and the SRQ-20 in correctly distinguishing between cases with maternal depression and maternal GAD and those without maternal depression and maternal GAD. The SCID was used to index the probability of the EPDS and SRQ-20, appropriately classifying participants using the area under the curve value (AUC). The sensitivity was plotted against the specificity for both the EPDS and the SRQ-20. The ROC analyses are shown in Figures 4.3, 4.4 and 4.5.

4.5.1 Baseline ROC Analysis for EPDS and SCID for Depression

The results of ROC analysis for the EPDS and the SCID show that the EPDS at the baseline had an AUC of 0.92 (95% CI: 0.88–0.97) with a standard error of 0.22. The ROC analysis provided a cut-off score of 11. The EPDS had an excellent predictive value since the AUC was above 0.90. The results of ROC analysis show that the EPDS with an ROC area of 0.92 performed significantly better as a screening tool for depression than the SRQ-20, which had an ROC area of 0.87 (see Figure 4.3). The Luganda version of the EPDS showed a sensitivity of 82.76%, a specificity of 82.57%, a positive predictive value of 71.64%, and a negative predictive value of 90% (See Tables 4.37 And 4.38)

Table 4.37

Sensitivity and Specificity for The Luganda Version of the EPDS

	SCID-IV	
	Depressed n=58 (%)	Not Depressed n=109 (%)
EPDS		
Depressed	48 (82.76)	19 (17.43)
Not Depressed	10 (17.24)	90 (82.57)

Table 4.38

Positive and Negative Predictive Value for The Luganda Version of the EPDS

	SCID-IV	
	Depressed n=58 (%)	Not Depressed n=109 (%)
EPDS		
Depressed	48 (71.64)	19 (28.36)
Not Depressed	10 (10.00)	90 (90.00)

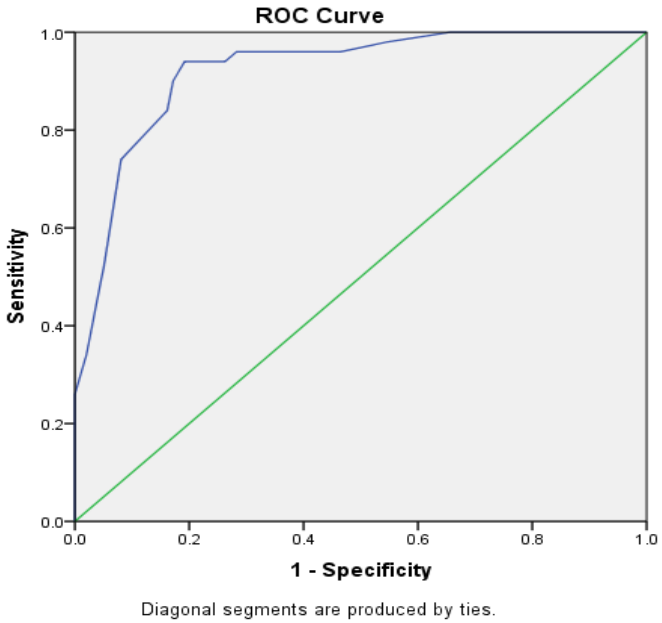

Figure 4.3. Baseline receiver operating characteristic analysis (ROC) for Edinburgh Postnatal Depression Scale and Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV Axis I Disorders for Depression.

4.5.2 Baseline ROC Analysis for SRQ-20 and SCID for Depression

The results of ROC analysis for the SRQ-20 at the baseline had an AUC of 0.87 (95% CI: 0.81–0.93) with a standard error of 0.03 indicating moderately high accuracy. The ROC analysis provided a cut-off score of 5. The SRQ-20 had a good predictive value since the AUC was between 0.80 and 0.90. The results of ROC analysis show that SRQ-20 with an ROC area of 0.87 performed significantly lower as a screening tool for depression than the EPDS, which had an ROC area of 0.92 (see Figure 4.4).

The Luganda version of the SRQ-20 for screening Depression showed a sensitivity of 74.14%, a specificity of 77.06%, a positive predictive value of 63.24%, and a negative predictive value of 84.85% (See Tables 4.39 And 4.40)

Table 4.39

Sensitivity and Specificity for The Luganda Version of the SRQ-20 for Screening Depression

	SCID-IV	
	Depressed n=58 (%)	Not Depressed n=109 (%)
SRQ-20		
Distressed	43 (74.14)	25 (22.94)
Not Distressed	15 (25.86)	84 (77.06)

Table 4.40

Positive and Negative Predictive Value for The Luganda Version of the SRQ-20 for Screening Depression

	SCID-IV	
	Depressed n=58 (%)	Not Depressed n=109 (%)
SRQ-20		
Distressed	43 (63.24)	25 (36.76)
Not Distressed	15 (15.15)	84 (84.85)

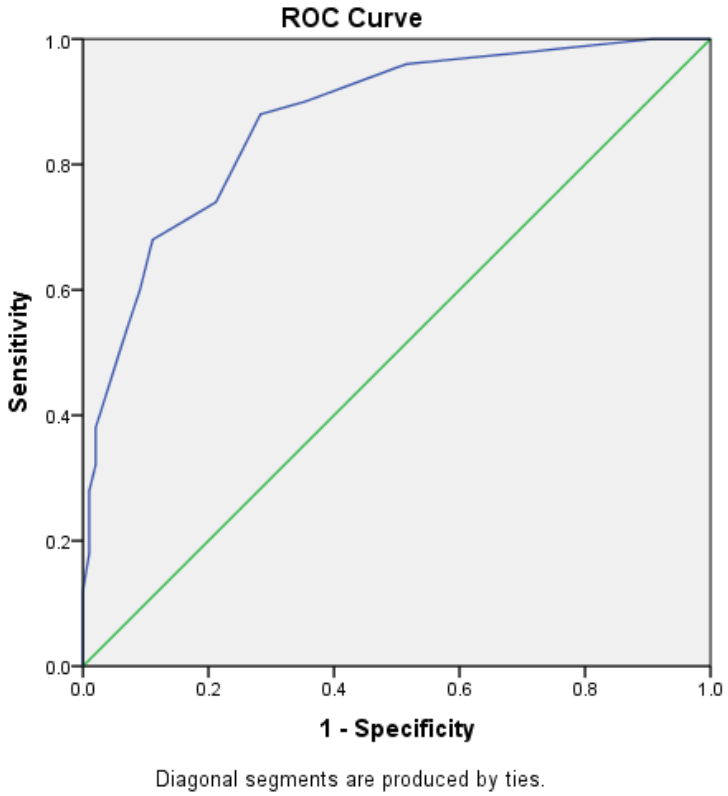

Figure 4.4. Baseline receiver operating characteristic analysis (ROC) for Self-Reporting Questionnaire and Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV Axis I Disorders for Depression.

4.5.3 Baseline ROC Analysis for SRQ-20 and SCID for AADA

The results of ROC analysis for the SRQ-20 at the baseline had an AUC of 0.78 (95% CI: 0.69–0.86) with a standard error of 0.042, indicating fair accuracy. The ROC provided a cut-off score of 6 As a screening tool for AADA, the SRQ-20's had a fair predictive value, since the AUC was between 0.70 and 0.80 (see Figure 4.5).

The Luganda version of the SRQ-20 for screening Depression showed a sensitivity of 73.68%, a specificity of 68.99%, a positive predictive value of 41.18%, and a negative predictive value of 89.90% (See Tables 4. And 4.1)

Table 4.41

Sensitivity and Specificity for The Luganda Version of the SRQ-20 for Screening Anxiety

	SCID-IV	
	Anxious n=38 (%)	Not Anxious n=129 (%)
SRQ-20		
Distressed	28 (73.68)	40 (31.01)
Not Distressed	10 (26.32)	89 (68.99)

Table 4.42

Positive and Negative Predictive Value for The Luganda Version of the SRQ-20 for Screening Anxiety

	SCID-IV	
	Anxious n=38 (%)	Not Anxious n=129 (%)
SRQ-20		
Distressed	28 (41.18)	40 (58.82)
Not Distressed	10 (10.10)	89 (89.90)

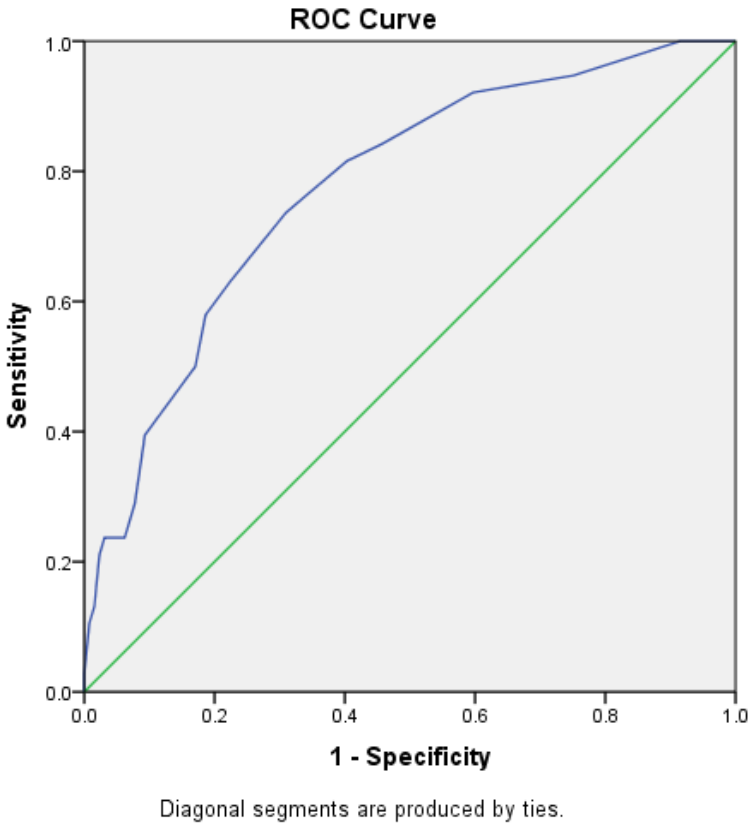

Figure 4.5. Baseline receiver operating characteristic analysis (ROC) for Self-Reporting Questionnaire and Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV Axis I Disorders for Generalised Anxiety Disorder.

4.6 Multivariable Analysis

Variables that were significant in the bivariate analysis at baseline and follow-up were further analysed in four multivariable analyses that is, two at baseline and two at follow-up. These included:

- Three independent variables and maternal depression at six weeks postpartum.
- Two independent variables and maternal psychological distress at six weeks postpartum.
- Five independent variables and maternal depression at six months postpartum.
- Three independent variables and maternal psychological distress at six months postpartum.

These were entered into analysis multiple logistic regression model because of the dichotomous nature of the dependent variables.

4.6.1 Multivariable Logistic Analysis for Maternal Depression at Six Weeks Postpartum

Multiple logistic regression was performed to assess the impact of variables associated with maternal depression at six weeks postpartum. Three independent variables – SSE, relationship discord and social support – were included in the analysis. The lowest quintile, relationship discord and social support significantly contributed to the model. The strongest predictor of maternal depression was relationship discord with an odds ratio of 1.17 (see Table 4.43).

Table 4.43

Multiple Logistic Regression for Maternal Depression at Six Weeks Postpartum

Index	B	S.E.	Wald	*df*	*p*	OR	95% C.I. for OR
Poverty Quintile (1)	1.30	.58	5.02	1	.025	.27	(.09-.85)
Relationship Discord	.16	.06	7.56	1	.006	1.17	(1.05-1.32)
Social Support	-.04	.02	7.40	1	.007	.96	(.93-.99)
Constant	.17	1.24	.02	1	.890	1.19	

Note: *df* = degrees of freedom; *p* = significance; OR = odds ratio; CI = confidence level; $R^2 = 0.45$ (Hosmer & Lemeshow), 0.17 (Cox & Snell), 0.23 (Nagelkerke); Model X^2 (6, N = 167) = 30.71, $p < 0.05$; variable(s) entered in step 1: Poverty Quintile, Relationship Discord, and Social Support

4.6.2 Multivariable Analysis for Maternal Psychological Distress at Six Weeks Postpartum

Multiple logistic regression was performed to assess the impact of variables associated with maternal psychological distress at six weeks postpartum. The independent variables included in the analysis were relationship discord and social support. Relationship discord significantly contributed to the model and was the strongest predictor of maternal psychological distress with an odds ratio of 1.4 (see Table 4.44).

Table 4.44

Multiple Logistic Regression for Maternal Psychological Distress at Six Weeks Postpartum

Index	B	S.E.	Wald	*df*	*P*	OR	95% C.I. for OR
Relationship Discord	.34	.07	26.30	1	.00	1.40	(1.23-1.60)
Social Support	-0.02	.02	1.48	1	.22	.98	(.95-1.01)
Constant	-3.68	1.25	8.67	1	.00	.03	

Note. *df* = degrees of freedom; *p* = significance; OR = odds ratio; CI = confidence level; R^2 = 0.86 (Hosmer & Lemeshow), 0.21 (Cox & Snell), 0.28 (Nagelkerke); Model X^2 (6, N = 167) = 39.55, $p < .05$; variable(s) entered in step 1: Relationship Discord, Social Support

4.6.3 Multivariable Analysis for Maternal Depression at Six Months Postpartum

Multiple logistic regression was performed to assess the impact of variables that were significantly associated with maternal depression. Relationship discord at six months, relationship discord at six weeks, maternal psychological distress at six weeks, maternal AADA at six weeks and maternal depression at six weeks were included in the analysis as independent variables. Relationship discord at six months and maternal psychological distress at six weeks significantly contributed to the model. The strongest predictor of maternal depression at six months was relationship discord at six months, recording an odds ratio of 1.18 (see Table 4.45).

Table 4.45
Multiple Logistic Regression for Maternal Depression at Six Months Postpartum

Index	B	S.E.	Wald	*df*	*p*	OR	95% C.I. for OR
Relationship Discord at Six Months	.16	.07	5.25	1.00	.02	1.18	(1.02-1.35)
Relationship Discord at Six Weeks	.01	.09	.01	1.00	.93	1.01	(.84-1.20)
Psychological Distress at Six Weeks	(1.95)	.70	7.76	1.00	.01	.14	(.04-056)
AADA at Six Weeks	.21	.63	.11	1.00	.74	1.24	(.36-4.29)
Maternal Depression at Six Weeks	.53	.64	.69	1.00	.40	1.70	(.49-5.93)
Constant	(4.22)	1.81	5.43	1.00	.02	.01	

Note. df = degrees of freedom; *p* = significance; OR = odds ratio; CI = confidence level; $R^2 = 0.24$ (Hosmer & Lemeshow), 0.16 (Cox & Snell), 0.28 (Nagelkerke); Model X^2 (5, N = 149) = 25.26, $p < 0.05$; variable(s) entered in step 1: Relationship Discord at Six Months, Relationship Discord at Six Weeks, Maternal Psychological Distress at Six Weeks, Maternal AADA at Six Weeks, Maternal Depression at Six Weeks

4.6.4 Multivariable Analysis for Maternal Psychological Distress at Six Months Postpartum

Multiple logistic regression was performed to assess the impact of psychosocial factors of maternal depression. Poverty, maternal psychological distress at six weeks postpartum and relationship discord were included in the analysis as independent variables. Relationship discord, maternal psychological distress at six weeks postpartum and the second quintile significantly contributed to the model. The strongest predictor of maternal psychological distress was poverty, recording an odds ratio of 9.23 (see Table 4.46).

Table 4.46

Multiple Logistic Regression for Maternal Psychological Distress at Six Months Postpartum

Index	B	S.E.	Wald	*Df*	*p*	OR	95% C.I. for OR
Poverty Quintile (2)	2.22	.84	7.01	1	.01	9.23	(1.78-47.85)
Maternal Psychological Distress at Six Weeks Postpartum	.12	.05	5.01	1	.03	1.13	(1.02-1.26)
Relationship Discord	.17	.06	7.87	1	.01	1.19	(1.05-1.34)
Constant	(5.22)	1.03	25.54	1	.00	.01	

Note. df = degrees of freedom; *p* = significance; OR = odds ratio; CI = confidence level; $R^2 = 0.57$; (Hosmer & Lemeshow), 0.20; (Cox & Snell), 0.30 (Nagelkerke). Model X^2 (6, N = 149) = 32.56, $p < .05$; variable(s) entered in step 1: Poverty Quintile, Maternal Psychological Distress at Six Weeks Postpartum, Relationship Discord

4.7 Summary of the Results

This section looks at the summary of results at baseline and follow-up study points.

4.7.1 Baseline Results

Slightly more than one-third of the participants were diagnosed with a major depressive episode while less than one-quarter (22.75%) of the participants met the criteria for AADA. The comorbidity rate for maternal depression and AADA was 16.17%. Poverty, relationship discord and social support were significantly related to depression. There was a trend towards significance between marital status, religious affiliation, tribe and maternal psychological distress. Maternal psychological distress and WAZ were significantly related and there was a trend in WHZ among participants with maternal psychological distress and those without. Furthermore, relationship discord and social support were associated with maternal psychological distress. Relationship discord was significantly related to maternal AADA.

4.7.2 Follow-Up Results

At six months postpartum, 14.09% of the participants met the criteria for a major depressive episode while only 6.71% of the participants met the criteria for GAD. The comorbidity rate for participants who had both depression and GAD during the follow-up period was 3.4%.

Maternal depression at six weeks postpartum was associated with depression at six months postpartum. Relationship discord at six weeks and at six months was associated with depression at six months postpartum. There was a trend between tribe, social support, and exclusive breastfeeding and maternal depression at six months postpartum. Additionally, there was a trend between comorbidity at six weeks postpartum and maternal depression at six months postpartum. There was also a trend between maternal depression at six weeks postpartum and maternal psychological distress at six months postpartum. There was a trend towards significance for exclusive breastfeeding, relationship discord and maternal GAD at six months postpartum.

At six months postpartum, poverty and relationship discord were significantly related with maternal psychological distress. There was a trend between relationship discord at six weeks postpartum and maternal psychological distress at six months postpartum. Maternal psychological distress at six weeks postpartum was associated with maternal depression, maternal GAD, maternal psychological distress and comorbidity at six months postpartum. Exclusive breastfeeding at six weeks postpartum and maternal depression at six months was associated with WAZ and WHZ at six months postpartum. However, there was a trend for WAZ and comorbidity.

On the KDI at six months postpartum, relationship discord at six weeks postpartum was related to locomotor functioning. Furthermore, there was a trend for poverty and

psychomotor development on both the KDI and DMC. The DMC results showed the following:

Social support at six months postpartum was significantly related to psychomotor development; maternal depression, maternal psychological distress and relationship discord at six weeks postpartum were associated with language development at six months postpartum; a trend for depression and comorbidity at six months postpartum and language development; a trend between comorbidity at six months postpartum and locomotor functioning; and a trend for maternal depression at six months postpartum and fine motor functioning.

These findings are synthesised in the next chapter.

Chapter 5: Discussion

5.1 Introduction

This chapter provides a detailed discussion of the results presented in Chapter 4. The chapter is divided into eight sections: section one introduces the chapter, while section two discusses the sociodemographic characteristics of the participants; the third section discusses the prevalence of maternal mental illness at six weeks and six months postpartum, the fourth section discusses the psychosocial predictors of maternal mental illness; the fifth section focuses on maternal mental health and infant growth; section six focuses on maternal mental health and infants' psychomotor functioning; section seven focuses on the effectiveness of the EPDS and SRQ-20 as screening tools for maternal mental health in Uganda, and section eight summarises the chapter.

5.2 Sociodemographic Characteristics in the Postpartum Period

The respondents in this study lived in rural Masaka District, Uganda. At baseline (six weeks), 167 mother-infant dyads participated in the study, while at follow-up (six months) 149 mother-infant dyads of the initial sample were interviewed. The maternal participants' ages ranged from 18 to 42 years which is consistent with data from the Uganda Bureau of Statistics, (2017a), where the reproductive age of Ugandan women is between 15 and 49 years. In this study, most of the participants were below the age of 24, a common occurrence among women in Uganda where many marry at a young age, either in their teens or early adulthood (Nakku et al., 2006; Watson, Bantebya, & Muhanguzi, 2018; Wodon, Male, Onagoruwa, Savadogo, & Yedan, 2017). The results of this study also indicated that the majority of the participants (slightly less than three-quarters) were cohabiting while one-quarter had been formally married in religious institutions.

The majority of participants were of the Ganda tribe since Masaka District is located in central Uganda, which is part of the Buganda kingdom, and the Ganda are the indigenous people of this area (Uganda Bureau of Statistics, 2017b). Close to two-thirds of the participating mothers had an education level of primary and below, which is reflective of the high illiteracy in rural Uganda (Uganda Bureau of Statistics, 2017b). Nearly 90% of the 169 mothers were multiparous. Out of 169 infants in this study, just over 90% were vaginally born with slightly above 80% of them being exclusively breastfed. Half of the 149 infants in the study were still being exclusively breast fed at the six months follow-up. Most of the participants were considered poor, with very few owning property or items such as radios, bicycles and livestock which are considered a sign of affluence.

5.3 Prevalence of Maternal Mental Illness

In this section, presents the discussion on the prevalence of maternal postpartum depression, maternal AADA or maternal GAD and maternal psychological distress as well as the comorbidity of maternal depression and maternal AADA or maternal GAD in Uganda. This is at both six weeks and six months postpartum stages of the study.

5.3.1 Prevalence of Postpartum Maternal Depression

The SCID IV which is a diagnostic tool was used to measure the prevalence of major depression. The prevalence for major depression among the participants was 34.7% and 14.1% at six weeks and six months, respectively. There was considerable reduction in diagnostic depression at 6 months (from 34.7% to 14.1%). The prevalence of depression at both baseline and follow up study points in this study was higher compared to earlier postpartum studies conducted in Uganda. For example, Cox (1983) found a prevalence of 10%, Nakku et al. (2006) reported a 6.1% prevalence while Singla et al. (2015) found a

prevalence of 12.51% in the intervention group and 10.44% in the control group. However, in Western Uganda, a higher prevalence of 41% was reported by Kakyo et al. (2012). It is important to note that the above studies, Cox (1983) and Kakyo et al. (2012) used the EPDS while Singla et al. (2015) used Center for Epidemiologic Studies Depression Scale as screening tools as opposed to a diagnostic tool to assess depression while Nakku et al. (2006) used the Mini International Neuro-psychiatric Interview (MINI) which is a diagnostic tool.

The findings of this study also show a higher prevalence of depression compared to the prevalence found in the general population in Uganda. Research carried out across Uganda by Kinyanda et al., (2011) found a prevalence of 29.3%, while Bolton, Wilk, and Ndogoni (2004) found a prevalence of 24.4% in Masaka, Uganda. Bolton, Wilk, and Ndogoni (2004) and Kinyanda et al.'s (2011) findings are consistent with findings from Perkins et al. (2018) that reported a prevalence of depression of 25% among women for their Ugandan study.

The prevalence of depression found in this study is also consistent with findings from other sub-Saharan African countries. For example, studies from LMICs – South Africa (Tomlinson et al., 2006), Malawi (R. C. Stewart et al., 2010), Nigeria (Adewuya et al., 2008) and Ethiopia (Servili et al., 2010) – all clearly indicate high prevalence of postpartum depression.

The high prevalence of depression, as indicated from studies conducted in Uganda and other LMICs, can be attributed to several factors, such as methodological differences, study settings, regional and cultural differences in practices, a heavy burden of unrecognised and untreated cases, harsh poverty conditions, different community perceptions about mental illness, stigmatisation attached to mental illness and levels of social support (Halbreich & Karkun, 2006; Kinyanda et al., 2018; D. J. Stein & Gureje, 2004).

It is important to note that the diagnosis of depression can easily be affected by the assessment time at which the diagnosis is carried out (Azale et al., 2018). The results of this study could, therefore, have been affected by when the assessment/diagnosis was carried out. Assessments early in the postpartum period usually yield a higher prevalence than those done in the late postpartum period. Other factors that contribute to the high levels of the prevalence in Uganda may include high levels of poverty, low levels of social support and intimate partner violence (Falah-Hassani, Shiri, & Dennis, 2017; Kakyo et al., 2012; Mental Health and Poverty Project, 2010; Musoke, 2002; Nakku et al., 2006).

The present study tried to mitigate for biased results by having two points of assessment, at six weeks and at six months. The results of the study show that the participants were less depressed at six months than at six weeks. This could imply that early intervention may be important to prevent depression and the resulting effects of depression on both the mother and infant. However, it could also be that participants are better able to cope with the demands of motherhood with the passage of time (Currie, 2018).

Additionally, Villegas et al. (2011) found that postpartum depression is likely to be higher among women living in rural areas than those in urban settings in LMICs. This could be due to increased hardships that are found in rural settings compared to those in urban settings. Women in urban areas have access to health services and social support, which greatly mitigates depression (Villegas et al., 2011). When comparing HICs and LMICs, particularly rural settings, the prevalence for postpartum depression is higher in low- to middle-income rural areas (Adu et al., 2019; Duman, Senturk Cankorur, Taylor, & Stewart, 2018; Villegas et al., 2011) . This is due to a number of factors, which may include poverty and lack of access to health services. It may therefore, be concluded that women living in rural areas in LMICs are more vulnerable to developing postpartum depression compared to those living in urban areas. Mitigation measures that increase access to socioeconomic and

health care resources for rural women would therefore, be important to address the high prevalence of depression in Masaka District of Uganda.

5.3.2 Prevalence of Postpartum Maternal GAD

In this study, less than one-quarter (22.75%) of the participants met the DSM IV criteria for AADA at six weeks postpartum while only 6.71% of the participants were diagnosed with GAD at six months postpartum. These findings, however, differ from Reck et al. (2008) and Wenzel et al. (2005) studies in Germany and United States of America, respectively, which reported that maternal GAD was likely to be more prevalent than depression but are within range compared to other maternal postpartum AADA and GAD studies.

Globally, a number of studies have focused on postpartum depression, while there has been a paucity of studies focusing on maternal GAD. This is because, quite often, anxiety disorders have been presumed to be part of depression even when they have divergent aetiology and symptoms. During the postpartum period, a number of women are overwhelmed with the circumstances surrounding them and the likelihood of suffering from maternal GAD is high. However maternal GAD is rarely assessed and studied compared to maternal depression. This finding is not different from Uganda or Masaka District where the study was conducted. No studies were found that have focused on the prevalence of maternal GAD in Uganda.

While the results of this study show that the prevalence of maternal GAD is lower than the prevalence of major depression at both assessment points, they indicate that maternal GAD prevalence is still high and is a cause for concern. In addition, the prevalence at six weeks postpartum (baseline) was high compared to other studies. However, at six months postpartum (follow up) the findings of this study are comparable to previously reported prevalence (Barthel et al., 2016; Guo et al., 2013; Matthey, Fisher, & Rowe, 2013; Reck et

al., 2008). This study shows that the prevalence of maternal AADA was higher at baseline compared to the prevalence of maternal GAD at follow-up, indicating a decreasing prevalence. This could be explained by the assertion that maternal AADA is more prevalent in the first four weeks and is highest in the first week, after which a reversal trend occurs (Adewuya & Afolabi, 2005; Barthel et al., 2016; Pawluski et al., 2017). Several factors contribute to these findings, including the fact that immediately after birth, mothers are sometimes overwhelmed by the shift in roles of caregiving, survival of the child, her own health and that of their child and financial strain (Dennis et al., 2018; Falah-Hassani et al., 2017).

From the interviews carried out at six weeks, many new mothers reported that they were worried about the extra household work-load, fear of the child falling sick, lack of food in the home and the changes in spousal relationships after birth. This contextual anxiety may possibly reflect anticipatory anxiety about future or upcoming events. The difference between this anticipartoy anxiety and GAD is the possibility that mothers who experience GAD are also sensitive to unpredictability, but their threshold for abnormal responding is higher and are likely to meet more creterias (Grillon et al., 2009; Hinrichsen & Clark, 2003). Futhermore the overwhelming caregiving responsibilities coupled with living in poverty and sometimes social isolation may all converge to produce both emotional and material demands which bring about GAD among these mothers. This sense of being overwhelmed may be reinforced by negative cognitions, hence leading the mother to misinterpret the social and the infants' cues (Dennis & McQueen, 2007; Fairbrother et al., 2016). However, as time goes on, some mothers master handling these changes and demands. Good social support also plays an important role in lowering maternal GAD over time.

One of the aspects that distinguishes this study from other studies is that most studies on maternal AADA or maternal GAD have been conducted in hospital settings rather than

community settings. Hospital respondents may not exhibit high levels of GAD because of treatment they are receiving (Wenzel et al., 2005). It should be noted that in Uganda, especially in rural settings, very few mothers seek/access postpartum care services in hospitals.

Methodological differences in studies also affect the prevalence of maternal AADA or maternal GAD. Few studies use prospective study designs to compare two study assessment points, and those that have done so are limited by the sample size used (Wenzel et al., 2005, 2003). In order to deal with the small sample size limitation, this study used a large community sample.

Furthermore, most of the studies that have focused on GAD use screening tools rather than diagnostic tools. In this study, AADA or GAD was assessed using the SCID based on the DMS-IV diagnostic criteria as the gold standard diagnostic criterion. Screening tools tend to focus more on the somatic expression of AADA or GAD rather than the respondents' experience of AADA or GAD within their setting, which is more important in understanding what mothers experience in the postpartum period (Wenzel et al., 2003). From the current study, it is also evident that postpartum maternal AADA and maternal GAD are common and rampant during the postpartum period. This also demonstrates that the postpartum period is a time of risk as far as development of AADA and GAD is concerned, although it is still not yet clear when and how the occurrences may start during the postpartum period.

5.3.3 Prevalence Maternal Depression and Maternal GAD Comorbidity

Although maternal depression and maternal GAD comorbidity has been observed in postpartum samples, there are very few studies that have focused on studying the two. This is because these two disorders overlap due to the commonality of shared and unique symptomatology (Cunningham, Brown, & Page, 2016). The high comorbidity prevalence of

maternal depression and maternal GAD could be explained by, for example, the DSM-IV-TR features such as sleep difficulties, restlessness/psychomotor agitation, fatigability and concentration appearing in both major depressive disorder and GAD criterions (American Psychiatric Association, 2002; Tully & Cosh, 2013). Furthermore, apart from the diagnostic criteria being slightly similar, major depressive disorder and GAD respondents had similar cognitive processes, for example, they both experienced worrying and rumination problems (Soo, Burney, & Basten, 2009; Zainal & Newman, 2018).

GAD and major depressive disorder are the most common comorbid disorders across the life span (Oh et al., 2016; V. Sharma, 2018; Valderas, Starfield, Sibbald, Salisbury, & Rloand, 2009). Some studies have shown that almost half of the depression cases in primary health care settings report GAD as well (Cyranowski et al., 2012). Major depressive disorder or anxiety or comorbidity may sometimes leave residual symptoms which leave women susceptible to future diagnosis of both. This history, over time, affects the mothers' social functioning and ability to have a strong social support network.

Examining the prevalence of comorbidity of postpartum maternal depression and maternal GAD can aid in understanding whether the co-occurrence of the two significantly affects the mothers or the degree to which these disorders contribute independently during the postpartum period. Given the high comorbid prevalence of major depressive disorder and GAD, there is a need to focus on more research in this area and shift interventions towards multi-diagnostic approaches rather than specific disorder approaches (Tully & Cosh, 2013). Therefore, there is a need for a prevalence framework that highlights this shared and unique symptomatology of both depression and GAD.

The comorbidity prevalence for maternal depression and maternal AADA in the postpartum period was 16.17% at six weeks and the comorbidity prevalence for maternal depression and maternal GAD was 3.4% at the six months follow-up. There is a notable

12.77 points difference between the two data collection times. The expected significant drop in anxiety prevalence could be explained by the fact that as a mother becomes acquainted with expected and existing motherhood roles her anxiety levels may drop. The prevalence as observed in this study at six weeks postpartum is comparable to the 20% prevalence for comorbidity of GAD and depression reported by Woolhouse, Brown, Krastev, Perlen, and Gunn, in their 2009 study in Australia. However, the six months follow-up prevalence of comorbidity, as observed in this study, is lower than the comorbid prevalence of 8.1% found by Yelland et al. (2010) in Australia. This could be explained by the collective social support system within the rural setting that enables the mother to overcome her anxiety and lower the depression. Most mothers interviewed in this study lived close to their relatives and had several interactions with them, hence getting support from relatives on a daily basis. These comorbid prevalences provide an understanding of the important role that social support plays in mitigating comorbidity of depression and GAD for mothers in the postpartum period in rural Uganda.

5.4 Psychosocial Predictors of Maternal Mental Illness in the Postpartum Period

This study focused on poverty, social support and relationship discord as psychosocial predictors of maternal mental illness.

5.4.1 Poverty and Maternal Mental Illness in the Postpartum Period

Findings showed that poverty was significantly related to depression at six weeks postpartum and maternal psychological distress at six months postpartum. Poverty and socioeconomic deprivation are independently associated with maternal depression and maternal psychological distress, especially among those who are not employed and or lack formal education (Lund et al., 2010; Lund & Cois, 2018; Rotheram-Fuller et al., 2018). These

findings are consistent with the association between poverty and mental illness within the general population in LMICs (Baggaley et al., 2007; Kigozi et al., 2008; Lund et al., 2010, 2011). However, results for the postpartum samples give mixed results about the association between poverty and maternal mental illness. Plausible explanations for these differences in results could be that different studies use different assessment tools for both poverty and maternal mental illness and the varying definitions of poverty (Lund, 2014). For instance, this study used an assets register to measure poverty while other studies have either focused on income, education or affordability of meals in the home.

Whereas poverty is sometimes viewed as a major cause of mental illness, some authors view it as a catalyst rather than a cause (Kigozi et al., 2008; Ljungqvist, Topor, Forssell, Svensson, & Davidson, 2016). In some cases, poverty triggers distress that might result in depression and GAD. Severe levels of poverty may lead to frustration in the home, exacerbating the risk of having a mental breakdown. However, in some cases, poverty acts as a trigger to relapses of mental illness. Relapsing is sometimes associated with lack of financial stability. In some cases, being rich is sometimes viewed as protective against mental illness, especially in rural settings.

It should be further noted that most rural settings in Uganda are characterised by high levels of unemployment and thus high levels of poverty, especially amongst men, yet most of the women depend on the men's income for support (Kakyo et al., 2012). This dependence partly stems from the cultural and social arrangements which are embedded in most African communities and broader societies. The husband or the male spouse has control over the household income and making critical decisions. Yet when it comes to the postpartum period, the women are expected to fend for themselves since most men view childbirth and the period that follows as a woman's domain (Bantebya, 2009; Kakyo et al., 2012).

Another factor that is associated with poverty and maternal mental health in rural settings is accessibility to health services. Mothers who are poor and are also mentally ill may find it hard to seek and/or access health facilities. Furthermore, those who are able to access medical facilities may not be able to afford expensive medication and/or services. This trend of events may further discourage them from seeking help, which often worsens their mental illness (Kigozi et al., 2008; Ljungqvist et al., 2016).

5.4.2 Social Support and Maternal Mental Illness in the Postpartum Period

Social support was significantly related to maternal depression and maternal psychological distress. Several studies have also found an association between lack of social support and maternal mental illness (Kakyo et al., 2012; Nakku et al., 2006; Negron, Martin, Almog, Balbierz, & Howell, 2013; Reid & Taylor, 2015). Higher levels of social support have been associated with lowering of maternal mental illness incidences.

Traditionally, the postpartum period is one of the times when mothers receive a lot of social support both informally and formally (Mbekenga, 2011). As the mother receives this social support, it is expected that the levels of maternal mental illness will reduce. During this period, a number of social support rituals are performed for the mother and the infant. These social support rituals by the family and the community, which are also known as ethnokinship, have been established to play an important role not only as a system for caring for the mother and infant during the postpartum period but also in assisting in reducing maternal mental illness (Callister et al., 2010; Hernandez, 2017; Jamaludin & Aloysius, 2018). In Uganda, rituals such as *okunyiga* (helping the mother dispose of the placenta or any residues by steam bathing so she is purified), *ekyogero* (showering the baby in a mixture of local herbs which are boiled that cleanse and give blessings to the infant) and naming of the infant are helpful in calming the mother and rejuvenating her mental health (Barigye, 2019;

Beinempaka, Tibanyendera, Atwine, Kyomuhangi, & MacDonald, 2014; Kayom, Kakuru, & Kiguli, 2015).

The male spouses' support and behaviour during this period have a strong association with the mothers' health, particularly their mental health (Kakyo et al., 2012; Ruffell, Smith, & Wittkowski, 2019; Yazdanpanah, Khalili, & Dehghan, 2015). Lack of spousal support exacerbates maternal insensitivity, and maternal mental illness and affects the mother-infant relationship (Cooper & Murray, 1998; Ruffell et al., 2019). However, even if a spouse is not supportive during the postpartum period, support from family members, relatives, neighbours or friends – lessens the likehood of development of maternal mental illness during this period.

It should be noted, however, that in Uganda, especially in rural settings, there is a decline in the traditional provision of family social support from the extended families due to increasing economic and social pressures (Kinyanda et al., 2018, 2011). Given the high prevalence of maternal mental illness in rural areas and the high numbers of Ugandans who depend on social support as a measure to curb depression, there is a need to strengthen existing social support systems (Johnson et al., 2016; Johnson, Chin, Kajumba, Kizito, & Bangirana, 2017). One way to strengthen the social support system could be the provision of treatment approaches to maternal mental illness that increase the provision of social support (Patel et al., 2008; Wachs et al., 2009). These treatments and approaches should be implemented and institutionalised across communities in Uganda. In some parts of Uganda, Interpersonal Psychotherapy for Groups (IPTG), a population-based therapy, has improved the social support networks by increasing acceptance, forming of stronger friendships and teaching of basic survival skills to the participants (Bass et al., 2006; Black & Surkan, 2015; Bolton et al., 2004).

5.4.3 Relationship Discord and Maternal Mental Illness in the Postpartum Period

Relationship discord was significantly related to maternal depression, maternal psychological distress and maternal GAD. During the postpartum period, relationships that are troubled affect the mental health of new mothers (Davis et al., 2017; Tomlinson, Swartz, Cooper, & Molteno, 2004; Tsai et al., 2016b). Having a poor relationship with one's mother-in-law significantly contributes to marital conflict in the home, hence leading to maternal depression, maternal psychological distress and maternal GAD (Deng et al., 2014; Klainin & Arthur, 2009; Shi, Ren, Li, & Dai, 2018; Wang et al., 2017). This association between relationship discord and maternal mental illness is well documented (Conners-Burrow et al., 2013; Essex, Klein, Cho, & Kraemer, 2003; Murray & Copper, 1997). Mothers who are depressed, for instance, are most likely to be in relationships characterised by fights and hostility, criticisms, belittled opinions and emotional withdrawals. The degree and severity of the discord should be examined further to find out whether the more severe the conflict the more severe the degree of maternal mental illness. However, it should be noted that maternal mental illness can be both a result of relationship discord as well as a cause (Mikton et al., 2017; O'Mahen, Beach, & Banawan, 2001; Wenzel et al., 2005).

Relationship discord is sometimes based on the way the individual evaluates or processes their emotional state and habitual patterns of engagement in the current situation. Many women who experience relationship discord during the postpartum period find it hard to function at the optimum required level in their daily activities (Tsai et al., 2016b). It should be noted that relationship discord can lead to intimate partner violence (Mikton et al., 2017). Apart from the physical injuries that intimate partner violence can cause, the psychological damage can be immense for the woman. Psychological consequences of the relationship discord such as anxiety, sleep disturbances, shame, depression, symptoms of post-traumatic stress disorder (PTSD), suicidal behaviour and emotional detachment can have both short-

and long-term effects on the mothers (Centers for Disease Control and Prevention [CDC], 2017). These long-term and short-term effects not only impact the mother but can have far-reaching and devastating effects on the infants as well.

Relationship discord does not only affect mother-father interaction, but it also affects the way the mother views her ability to look after the infant, infant growth, infant psychomotor development and also the way the mother relates with other people living with her during the postpartum period. In some cases, relationship discord functions as a moderator or mediating variable between maternal mental illness and other outcomes such as the infant's psychomotor development (Conners-Burrow et al., 2013; Nasreen, Kabir, Forsell, & Edhborg, 2012).

5.5 Maternal Mental Health and Infant Growth in the Postpartum Period

Maternal psychological distress and WAZ were significantly associated at six weeks postpartum but not at six months. Maternal psychological distress has a stronger impact in the first months of growth although its effects are not as strong later on as the infant grows. The findings are in line with studies by (Anoop et al., (2004), Patel et al., (2002), Rahman, Iqbal, et al., (2004)At six weeks postpartum, results indicated that there was no association between infant growth and maternal major depression. However, at six months, maternal depression was significantly associated with WAZ and WHZ. Some studies have found an association between maternal depression and the infant's growth, although there are conflicting reports with other studies finding no relationship between the two variables (Choi et al., 2017; Christodoulou, Le Roux, et al., 2019; Grote et al., 2010; Holm-Larsen et al., 2018; Kazi et al., 2019; Santos et al., 2010).

Furthermore, the results of this study showed that maternal GAD and infant growth (WAZ, HAZ and WHZ) were not significantly associated. The findings are in line with Wisner et al. (2013) who, after controlling for lifetime GAD , found no association with

infant growth. However, some studies have argued that the association can and is likely to occur in low resource settings. Findings from HICs show a positive relationship between these two variables, although it is found particularly among those living in poverty (Drewett et al., 2004; O'Brien et al., 2004; Wright, Parkinson, & Drewett, 2006b). It should be noted that although this research was conducted in a low socioeconomic context, no association was found between the two variables.

Cohort studies have also stated that infant growth is most likely to be affected by maternal mental illness between four months and six months (Rahman, Iqbal, et al., 2004; R. C. Stewart, 2007). There is a possibility that the functional impairment caused by mental illness influences the mother's capability to deliver nutritional care to the infant. Depressive and anxiety symptoms such as impaired concentration, sentiments of hopelessness and worthlessness and psychomotor retardation may affect the mother's ability to look after the infant and the emotional quality of parenting, hence providing inadequate nutritional care especially through poor feeding habits (Patel, Rahman, et al., 2004; Pawluski et al., 2017; R. C. Stewart, 2007).

It should be noted, however, that the possible mechanism through which maternal mental illness affects infant growth may include the cultural context of the research, lack of consistent feeding of the infant and/or physical and emotional caregiving and lack of or little access to health care when the infant falls sick (Black et al., 2007; Nasreen et al., 2012; Rahman, Iqbal, et al., 2004). The cultural context in which a study is carried out could influence the results as well. While the studies from South Asia found an association, studies in sub-Saharan Africa have had contradictory findings. In South Asia, the gender of the infant was found to be associated with postpartum depression and infant growth. However, as much as gender of the infant is an important factor in the Uganda community, surviving the childbirth process supersedes the gender of the infant. In most Ugandan cultures, the gender

of the infant ceases to be the focus but rather the celebration is focused on the fact the woman has survived child-birth since it is viewed as a test of endurance (Bantebya, 2009). Furthermore, the rural communities hold the mothers who have given birth in high esteem because of the emphasis put on the endurance and tolerance of the physical pain and the life-threating experiences associated with it. They unwittingly teach the mothers to suppress any other concerns that are associated with childbirth (Bantebya, 2003). Given this community view, the immediate family members will often support the new mother and her infant, especially when it comes to reminding her to feed the baby or even bringing the baby to the mother for feeding when the infant cries, mostly during the first months (Byaruhanga et al., 2011; Mbonye et al., 2012).

Maternal competence in looking after the infant during the first year is very important as far as child growth is concerned (Patel, Rahman, et al., 2004). Furthermore, it has been argued that maternal competence and the effectiveness of the social support system play significant roles in the infant's growth and development in LMICs (Husain, Cruickshank, Tomenson, Khan, & Rahman, 2012).

Factors associated with the pregnancy often affect infant growth during the postpartum period. For instance, mothers who experienced GAD symptoms during pregnancy were most likely to give birth to babies with low birth weights, have preterm births, or have infants with neurodevelopment problems (Nasreen, Kabir, Forsell, & Edhborg, 2010; Wisner et al., 2013). It can, therefore, be inferred that if a mother has GAD during the antenatal period, this may skew the findings of a study that does not examine it from that study point.

Predictive factors such as breastfeeding and feeding practices are also likely to impact infant anthropometry (Fallon et al., 2018; Galler et al., 2000; Pawluski et al., 2017). Maternal mental illness symptoms may affect the mother's levels of energy and interest in activities, such as feeding the baby properly, or even forgetting to, or lack of concentration leading to

feeding insufficient quantities of food. This is sometimes coupled with poor dieting or food insecurity for the mother in the home. In some cases, maternal mental health, especially GAD, symptoms are associated with nonresponsive feeding styles of the infants (Fallon et al., 2018, 2016; Surkan et al., 2011). When infants do not respond to feeding, their growth could be affected. Maternal GAD symptoms significantly reduce the level of breastfeeding, which in turn may affect the growth of the infant (Galler et al., 2000; Pawluski et al., 2017).

An increment of infants' diarrhoeal episodes is often associated with maternal psychological distress, which in return may affect the growth of the infant (Rahman, Bunn, Lovel, & Creed, 2007). The relationship between these two variables is often associated with infant care practices. These care practices are not only determined by maternal factors such as nutrition, home environment, caregiver characteristics such as health or age and understanding of caregiving (World Health Organization, 2004).

Other factors that could contribute to these findings could be premature babies or low birth weight, which is also considered fundamental in determining the infant's WAZ and HAZ (Nasreen et al., 2010; Patel et al., 2002; Rahman, Lovel, et al., 2004; Surkan et al., 2008). Not only is stunting affected by the above factors, it is also affected by biological influences such as mother's nutrition and height (Nasreen et al., 2012). Some studies have also argued that the mother's perception of the infant's temperament could be associated with both stunting and infants being underweight (Baker-Henningham, Hamadani, Huda, & Grantham-McGregor, 2009; Nasreen et al., 2012). Infants who are unpredictable, un-adaptable and/or fussy are likely to affect the mother's actions towards feeding, which may affect the infant's nutritional status.

5.6 Maternal Mental Health and Psychomotor Functioning in the Postpartum Period

Results showed that maternal depression and maternal psychological distress were associated with language development. A trend for maternal depression at six months postpartum and fine motor functioning and a trend between comorbidity and locomotor and language development functioning were found. The results also showed that social support at six months postpartum and relationship discord at six weeks postpartum was significantly related to psychomotor development. However, there was a trend towards an association between poverty and psychomotor development.

Although results showed no relationship between overall psychomotor development and comorbidity of maternal depression and maternal GAD, a trend in the relationship was observed. There was a trend towards significance for comorbidity and language development and between comorbidity and locomotor functioning. Furthermore, infants of comorbid participants had a lower mean on locomotor functioning compared to those who were depressed, anxious or psychologically distressed.

The findings of this study are consistent with the results reported in the literature. For instance, as far as the association between language development and depression is concerned, the findings are consistent with previous reports by Hadley, Tegegn, Tessema, Asefa, and Galea, (2008), Laplante et al. (2004), and A. Stein, Malmberg, Sylva, Barnes, and Leach (2008), who found that infants with depressed mothers were more likely to have inferior scores in language development compared to those whose mothers did not have depressive symptoms. These results are also in line with Servili et al.'s (2010) study in Ethiopia, which found no association between postpartum depression and infant development. L. Murray (1992) also found similar results as far as postpartum depression and cognitive and language development were concerned.

The findings also agree with a study by Hadley et al. (2008) who found that maternal GAD did not affect the child's overall development. The study findings further assert what Foss, Andjukenda, and Hendrickson (2001) found: maternal GAD is not associated with psychomotor development. These findings are consistent with existing literature stating that maternal psychological distress impacts the infants' mental health and development (K. Bergman, Sarkar, & Connor, 2007) and is further strengthened by studies on maternal stress during pregnancy that found a negative association between maternal stress and poor cognitive outcomes in infants (Huizink, de Medina, Mulder, Visser, & Buitelaar, 2003; Laplante et al., 2004). The findings are also in line with Porto, Nunes, and Nelson (2016) who found that maternal stress was statistically related to maternal depression, maternal GAD and emotional processing and attention behaviour toward the infants.

Furthermore, the findings are in line with Richter and Reck (2013), who found that maternal psychological distress was related to psychomotor functioning. On the other hand, the study findings differ from Brouwers, Baar, and Pop (2001), T. Field et al. (2003), and Reck, Van Den Bergh, et al. (2018), who found that maternal GAD was associated with psychomotor functioning outcomes. They are also not in line with Galler et al. (2000), who found that maternal GAD is associated with infants' personal social development. The probable hypothesis that may help account for the above findings is that positive mother-infant interaction may intervene and compensate the impact of GAD on the development of the infant. In line with this argument, Richter and Reck (2013) found that the mothers' responses in particular situations were an important factor in mitigating the negative effect of maternal GAD on the infants.

These results, however, contradict what most studies have found: that maternal depression has adverse effects on the psychomotor development of infants in both HICs and LMICs (Murray, Halligan, & Cooper, 2010; Sohr-Preston & Scaramella, 2006; D. E. Stewart,

Robertson, Dennis, Grace, & Wallington, 2003; Walker et al., 2011). Although there is a paucity of research in the area of postpartum maternal GAD and psychomotor functioning, the findings are in line with the literature review that asserts there is no association between maternal GAD and infant psychomotor functioning.

The inconsistency between the findings of this current study and other studies demonstrates that there is no singular causal predictor of psychomotor development, but rather a number of factors could be simultaneously contributing to it. One of the plausible explanations of these findings is the fact that the prevalence of depression, GAD, comorbidity and maternal psychological distress had dropped tremendously between six weeks and six months. For example, by six months the number of participants with postpartum GAD had significantly dropped from 22.8% to 6.7%. Because of the latter small prevalence, chances are high that the impact of GAD was not associated with psychomotor functioning.

The trend found in this research as far as psychomotor development and comorbid maternal depression and maternal GAD are concerned, may have dire consequences to both the mother and infant. Previous research suggests that comorbidity has more dire consequences than depression or GAD alone (O'Garro-Moore, Adams, Abramson, & Alloy, 2015). Porto et al. (2016) assert that a mother's comorbid depression and GAD increases the adverse effects on development across the infant's life span. Women who experience depression and GAD comorbidity may suffer from long-term mood disorder (Dipietro, Costigan, & Sipsma, 2008; McMahon, Barnett, Kowalenko, & Tennant, 2005). Additionally, the probability of either maternal GAD or maternal depression reoccurring is higher among comorbidity samples than their counterparts (Merikangas, Zhang, & Avenevoli, 2003). This may be a public mental health concern that warrants more research in order to develop preventive interventions.

This can be further linked to studies that suggest chronicity of maternal depression and maternal GAD are what affects infant psychomotor functioning rather than single episodes (Cornish et al., 2005; Piteo et al., 2012; Servili et al., 2010). Chronic maternal mental illness is associated with infants' risks for cognitive and language delays. For example, maternal depression and GAD do not *per se* affect the psychomotor development of the infant, but if chronic and severe, would exert a considerable impact on the infant (Jalnapurkar et al., 2018; Sohr-Preston & Scaramella, 2006). Since infancy is a sensitive time where environmental stimulation influences a child's psychomotor development, mothers who have chronic mental illness are less likely to provide these environmental stimulations. When this occurs consistently over a long period of time, the infant is not nurtured well.

The difference in findings that maternal mental illness is not associated with infant psychomotor development could be explained by research that was conducted in Australia, reporting that an infant's cognitive, language or motor development problem becomes more pronounced in infants with chronically depressed mothers rather than in brief maternal postpartum depression (Cornish et al., 2005; Piteo et al., 2012). Brief maternal depression, which lasts less than one year or does not persist beyond one year postpartum, is not significantly associated with infant cognitive or psychomotor development (Cornish et al., 2005).

Chronic mental illness is often associated with greater disability in the mothers (Patel et al., 2002). For instance, mothers who are chronically depressed are more likely to experience a longer period of having lower levels of energy to cope with the demands of parenting compared to those who have a single episode. It can, therefore, be inferred that if symptoms of maternal mental illness causes disability and compromises maternal sensitivity and responsiveness, their effects will be more robust since the infant is in the same environment for a long period of time (Ierardi et al., 2019). Therefore, infants who encounter

prolonged periods of maternal withdrawal and or unavailability due to the mother's mental illness are more likely to be affected as far as their motor development is concerned compared to those whose mothers experience brief mental illness.

Mothers whose mental illness is resolved in the first six months should be in position to respond appropriately to their infant's needs, offering more security and interaction with their infants. Chronic maternal illness has been found to exacerbate infants' learning difficulties due to lack of exposure to facilitative components of speech but also due to high levels of negative maternal affect. Mothers who are living with chronic mental illness may sometimes have non-contingent interactional styles that further hinder their infants' ability to develop a symbolic thinking pattern. Furthermore, they experience poor cognitive development due to the lack of their mothers' physical touch, which affects the infants' neural development (Sohr-Preston & Scaramella, 2006). The risk of chronic maternal mental illness seems to be associated with a number of factors, especially post-pregnancy factors. For instance, poverty and marital discord are often associated with incidence and chronicity of maternal postpartum depression (Patel et al., 2002). Women whose hormones do not quickly return to normal levels after birth, those who go through traumatic birth experiences, young mothers, and mothers with poor social support and health complications after birth are more likely to experience chronic maternal mental illness (Bernazzani & Bifulco, 2003; Wisner, Perel, Peindl, & Hanusa, 2004). However, the time specification of chronic maternal mental illness varies from one researcher to another – from six months postpartum to mental illness that lasts throughout the first five years of the infant's life (Ahmed et al., 2019; Beck & Driscoll, 2006; Bina, 2019; Garman et al., 2019; Kendall-Tackett, 2005). It should be noted that in some cases maternal mental illness may have started before the mother conceived. These differences in the time points at which the research is conducted and the

length of the follow-up period makes it difficult to compare findings of the different studies and may account for the findings in this study.

The type of assessment tools used for psychomotor functioning may also play an important role in the difference in the findings (Cornish et al., 2005). Whereas other studies have used Bayley Scales of Infant and Toddler Development, Brazelton Neonatal Behavioural Assessment Scale and The Denver II to measure psychomotor functioning, this study used the Kilifi Developmental Inventory and the Developmental Milestones Checklist to assess psychomotor development (Abubakar, Holding, et al., 2008; Abubakar, Holding, Van de Vijver, Bomu, et al., 2010; Abubakar, Van de Vijver, Mithwani, Obiero, Lewa, Katana, et al., 2007). These two tools were specifically developed for resource-limited settings. This difference in tool usage could also account for the difference in the results.

It is imperative to note that most of the instruments used in researching maternal mental health and psychomotor development in LMICs are Western based or derived and results are affected by the translation process and cultural differences. These two factors affect the validity of the instruments due to differences in classification of mental illness and indigenous forms of expression (G.-C. Ali et al., 2016). Therefore, culture-specific development instruments are needed for children living in sub-Saharan Africa.

To eliminate the gap of mental health research and service delivery in LMICs, there is a need for adaptation and validation of research instrument or diagnostic tools (Arafat, Chowdhury, Qusar, & Hafez, 2016; Patel et al., 2008). When using research and diagnostic tools in assessment of children in Africa, it is important to ascertain that the tools are fair to all children in terms of cultural relevance of the testing items, familiarity with the testing materials, testing situation and the relevance of response rate to items, and demographic characteristics such as gender access to resources and educational services, culture and ethnicity.

There is, therefore, a need for the development of more culture-specific instruments for psychomotor development, and some tools have been developed for the sub-Saharan African setting. The Malawi Developmental Assessment Tool (MDAT) (Gladstone et al., 2010) was developed in Malawi to assess the development of children living in this context. The Kilifi Developmental Inventory (Abubakar, Van de Vijver, Mithwani, Obiero, Lewa, Kenga, et al., 2007) and The Developmental Milestones Checklist (Abubakar, Holding, Van de Vijver, Bomu, et al., 2010) were developed in Kenya for resource-limited settings to measure the infants and children's psychomotor development. The Parent Rating Scales of Motor and Language Development (Stoltzfus et al., 2001), developed in Tanzania, is a parent report scale that measures gross motor and language milestones for children between 6 and 59 months of age. The Grover-Counter Scale of Cognitive Development (Sebate, 2000) was developed in South Africa for children 3–10 years of age to assess their level of cognitive functioning.

Singla et al. (2015) argue that the findings are different depending on the setting of the study. Studies conducted within communities like this one tend to find no associations between psychomotor functioning and maternal mental illness, whereas findings from studies carried out in primary health care settings tend to differ (Patel, DeSouza, & Rodrigues, 2003; Quevedo et al., 2012; Surkan et al., 2011). This could be due to the fact that participants in primary health care settings are most likely to experience severe mental illness compared to those found in community settings.

Environmental stimulation within the home is another mitigating factor as far as psychomotor functioning is concerned (Ahun & Côté, 2019; Piteo et al., 2012; Reck, Van Den Bergh et al., 2018; Santos Jr et al., 2016), and have been found to play a key role in an infant's development. Piteo et al. (2012) found that the home environment was associated with both maternal depression and psychomotor development. There is evidence that mothers

who are suffering from mental illness are less likely to provide sufficient stimulation within the home environmental (Fernandes et al., 2018; Sampson, Duron, Mauldin, Kao, & Davidson, 2017). They provide fewer opportunities for the infants to explore their surroundings compared to mothers who are not depressed.

In HICs, infant psychomotor functioning has a strong association with the mother's ability to interact with the infant and also provide stimulus for development (toys and reading books) (Gewirtz, 2017; Piteo et al., 2012). However, in many African cultures, and in most Ugandan homesteads, especially in rural settings, these westnern stimulating toys and story books may be absent. On the other hand the absence of the toys and story books may be replaced by the mother ability to storytelling, imitation, singing, and imaginative playing. Futhermore there are no doubt many objects in Ugandan homes that can be used to stimulate the infants (cooking pots,drums, gourds that rattle), . On the other hand it has been found that even with the presence of these materials, depressed mothers may not use the stimulating objects and may not have the energy to read the story books or even participate in imitation or playing with the infant (Paulson, Dauber, & Leiferman, 2006).

Although rural homes in Uganda may not have a home environment with Western stimulating objects, there are other factors that may compensate for this. In rural Uganda, the mother's role in looking after the infant is sometimes taken over by other caregivers (mother or mother-in-law of the nursing woman or a maid or female relative) in the homestead, especially during the first three months (Byaruhanga et al., 2011; Mbonye et al., 2012). This could be the buffering factor that mitigates the likely impact of maternal mental illness on the infant. It should, however, be noted that the reverse may also affect both the mother and the infant (Rodrigues, Patel, Jaswal, & de Souza, 2003). Hadley et al. (2008) assert that challenging environments which are uncertain and erratic may force the children to adapt,

hence fostering more rapid development in these children than their counterparts. This could be true given the high levels of relationship discord found in the homes in this research.

Not only is infant psychomotor functioning affected by maternal mental illness, but relationship strain between parents could also affect it (Ahlfs-Dunn & Huth-Bocks, 2014; K. Bergman et al., 2007; Neamah et al., 2018). The adverse effects of relationship discord could extend to the infant's development. Child development outcomes are not only related to maternal depression but co-occur with marital or relationship discord (Goodman & Gotlib, 1999). Additionally, Peterson, Riggs, Guyon-Harris, Harrison, and Huth-Bocks, (2019) assert that relationship discord can independently affect outcomes such as language development especially in the first three years. Relationship discord has also been associated with low levels of both individual creative and physical play (Bernard-Bonnin, 2004; Murray et al., 1999). Individual creative and physical play is associated with locomotor functioning and language development.

5.7 The EPDS and SRQ-20 as Screening Tools for Maternal Mental Health

Diagnostic test are often characterized by sensitivity which is the probability that a person with a disease gives a positive test result—and specificity which is the probability that a healthy person will give a negative test result. However it is also important to consider the positive and negative predictive values (PPV and NPV respectively) of the test. The PPV is the probability that the person who is not healthy will give a positive test result while the NPV is the probability that a healthy person will give a negative test result. The Luganda version of the EPDS showed a positive predictive value of 71.64%, and a negative predictive value of 90% while the Luganda version of the SRQ-20 for screening depression a positive predictive value of 63.24%, and a negative predictive value of 84.85%. It should be noted that the PPV and NPV are functions of the sensitivity, the specificity, and the prevalence.

ROC curve analysis has two main outcomes: the diagnostic accuracy of the test and the optimal cut-point value for the test. Diagnostic accuracy can be defined as the proportion of correct decisions (that is true positives plus true negative) over the number of total tested (Hoo, Candlish, & Teare, 2017). The findings of this study suggest that the Luganda language versions of the EPDS and SRQ-20 were reasonably valid screening tools for maternal mental illness among postpartum mothers in rural Masaka District, Uganda, especially for maternal depression and maternal psychological distress, respectively. They indicate similar cut-off point scores compared to other settings. The Luganda version of the EPDS was found to be a valid and effective screening tool for depression in the postpartum period. The findings suggest that the Luganda version of the EPDS performed significantly better as a screening tool for depression compared with the SRQ-20. The results of ROC analysis show that the EPDS with a ROC area of 0.92 compared to the SRQ-20 with a ROC area of 0.87. As a screening tool for GAD, the Luganda version of the SRQ-20 had a fair predictive value (Pontius & Parmentier, 2014) with the AUC between 0.70 and 0.80.

A number of studies determine the optimal cut off score by balancing between the sensitivity and specificity of the ROC curve (Hanlon et al., 2008; Tandon, Cluxton-Keller, Leis, Le, & Perry, 2012; Van der Westhuizen et al., 2018). This study reveals that the Luganda version of the SRQ-20 performed significantly well as a screening tool for depression, although it was not as effective as far as screening for GAD in rural Masaka District. The ROC analysis for the Luganda version of the EPDS provided a cut-off score of 11, while the ROC analysis for the Luganda version of the SRQ-20 provided a cut-off score of 5.

However, often there is dilemma for researchers in deciding on how to balance between sensitivity and specificity. It should be noted that although the screening tools may show a high sensitivity while having a very low specificity, using such screening tools may mean

that a lot of false positive cases will be identified. In other words, how can these tools accurately identify the correct or true individuals suffering from maternal mental illness? If one reduces the false positives then false negatives will increase likewise if the false negatives are minimized then false positives will increase. Often because of the high sensitivity of instruments, they may end up with overwhelming numbers of wrong referrals. According to Hoo et al., (2017) selection of a test threshold should not depend on giving equal weight to sensitivity and specificity in order to achieve higher accuracy but rather on the purpose of the test.

Although the EPDS and SRQ-20 are widely used screening tools during the postpartum period, various studies that have validated them against the gold standard have found a wide range of cut-off scores. For instance, the Amharic version of EPDS in Ethiopia had a cut-off score of 5/6 (Hanlon et al., 2008), while the Shona language EPDS in Zimbabwe reported a cut-off score of 11/12 (Chibanda et al., 2010). The Chichewa version of the SRQ-20 in Malawi had a cut-off of 7/8 (R. C. Stewart et al., 2009)while in Rwanda the cut-off was 10 (Scholte et al., 2011). These divergent cut-off points could be due to the differences in the balance between sensitivity and specificity and the multiplicity of cultures (or cultural differences) across sub-Saharan Africa (Hanlon et al., 2008; Hoo et al., 2017).

Researchers must carefully evaluate the impact of culture and language on the validation process of screening tools. For instance, the SRQ-20 as a screening tool includes items on depression, GAD and somatic symptoms. However, sometimes respondents will mistakenly associate somatic symptoms to depressive syndrome (R. C. Stewart et al., 2009). This skews the results depending on the respondent's cultural habits and norms. The different cultural habits and norms may determine how people express themselves and respond to questions asked on both the SRQ-20 and the EPDS, thus explaining the variation in the cut-off points. Furthermore, this diversity in results can be explained by factors such as

discrepancies in translation, levels of emotional lexicon and shame associated with expressing and acknowledging negative emotions in some cultures (Arafat et al., 2016; D. E. Stewart et al., 2003).

Furthermore, the divergent cut-off points reported from the different culturally validated EPDS and SRQ-20 end up giving different screening prevalences (Sawyer et al., 2010). It should also be noted that screening tools often yield higher prevalence compared to diagnostic tools (Parsons et al., 2012). In this study, the prevalence of depression at both baseline and follow-up study points were higher on the EPDS as a screening measure than on the gold standard. This finding is common in LMICs and warrants a critical analysis. It should, therefore, be recommended that studies, especially in LMICs, use the two-stage screening procedure: using the screening tool to identify mothers who exceed a pre-specified threshold and a diagnostic tool at the same time (Sawyer et al., 2010). Studies in LMICs have mainly focused on using screening tools, yet there is a need to use both diagnostic and screening tools. Since screening tools often have higher prevalence this may not reflect the accurate numbers of persons with a given mental illness. However, given the limited resources in LMICs, practitioners and researchers can best utilise screening tools for effective and efficient intervention strategies.

A number of mothers live with either or both GAD and depression because it has not been detected by health professions. Because of this, most mothers in rural areas may not receive treatment. Therefore, screening tools with high specificity are needed (Kagee, Tsai, Lund, & Tomlinson, 2013). It is assumed that the more effective a screening tool is the more people suffering from mental illness, especially in the rural setting, may be identified and the higher the probability of receiving treatment. Community health workers or VHTs can be trained in the usage of the Luganda version of the EPDS and SRQ-20. These community

workers and VHTs can integrate screening activities using the two tools into their daily workflow (Hung et al., 2014).

A cut-off score that does not detect the majority of the participants and will not place a burden on the community workers or VHTs can be selected (Patel et al., 2008). An effective screening tool is important for diagnosis, especially in rural areas, and is likely to result in more people getting a proper diagnosis and receiving appropriate treatment (Paulden, Palmer, Hewitt, & Gilbody, 2009). However, it should be noted that although screening tools are used as a mechanism of reducing costs related to diagnosis, in some situations this may not be the case. Often the use of screening tools does not necessarily equate to cost effectiveness (Paulden et al., 2009).

A number of barriers and challenges are associated with the use of screening tools at home and in clinics in LMICs. In order for prenatal and postpartum screening to be feasible in rural settings, especially for maternal mental illness, both health system and structural barriers need to be addressed. Some of the barriers that hamper the usage of these screening tools include lack of accessibility to prenatal and postpartum mental health care for both the mother and the infant, a mother's refusal to accept the screening and intervention for mental illness, availability of maternal mental health services, lack of information about maternal mental illness and attitudes and stigma towards it (Jesse, Dolbier, & Blanchard, 2008; Nakku et al., 2016). There is also a need to deal with the service providers' attitudes toward the usage of these screening tools. There are mixed reactions towards the use of screening tools by the health workers. While some welcome the idea, others have reported that their acceptance of the screening tools may increase their workload which is already overwhelming to them (Nakku et al., 2016).

In order to deal with some of these barriers to the usage of the Luganda versions of the EPDS and SRQ-20, the EPDS and SRQ-20 must be validated in the different languages

and cultures across Uganda. This will help implement effective screening and eliminate the bias associated with the usage of Western screening tools. For instance, the World Health Organization (WHO) created the SRQ-20 as a universal screening tool for detection of mental illness on the presupposition that mental health disorders are at equivalent levels across the world (World Health Organization, 1994). This notion, however, has been refuted by some researchers who still consider the SRQ-20 to be a Western world tool. In order to deal with this, several studies have been conducted to validate the SRQ-20 especially in LMICs (G.-C. Ali et al., 2016; Hanlon et al., 2008; Husain et al., 2016; Kortmann & Horn, 1988; Nakigudde et al., 2008; Netsereab, Kifle, Tesfagiorgis, & Habteab, 2018; Scholte et al., 2011; R. C. Stewart et al., 2009; Van der Westhuizen et al., 2017).

Training of health workers, VHTs, counsellors and social workers in screening, diagnosis and treatment of maternal mental illness is of paramount importance. VHTs should be trained not only in screening maternal mental health but also in community mobilisation, sensitisation and offering of social support for the affected mothers at the community level. This will help improve help-seeking behaviour of the mothers who are suffering from maternal mental illness and those who are prone to it (Kigozi et al., 2016). Last but not least, the usage of these screening tools should be integrated into Uganda's mental health care plan (MHCP). Some of the aims of the MHCP include provision of equitable and evidence-based mental health care services as well as strengthening and promoting mental health care services at the community level (Kigozi et al., 2016).

Conclusively, the Luganda versions of the EPDS and SRQ-20 were found to be reliable and valid screening tools which can be used in Uganda to screen for maternal mental illness. They can be used by the various health workers such as VHTs and community counsellors in both primary care health units and within the community. It is therefore, recommended that for the effective usage of the Luganda versions of EPDS and SRQ-20, the

screening should take place at two levels – the health facilities by the health workers and counsellors or social workers and the community level by the VHTs. If integrated within antenatal and postpartum care, these tools will help reduce the challenges related to detection of maternal mental illness during the postpartum period. Furthermore, these two tools can be used in future research that focuses on maternal mental illness and its consequences, especially during the postpartum period.

5.8 Chapter Summary

Understanding the context in which maternal mental illness and infant growth and development occurs during the postpartum period is very important, especially to public mental health. This study used the bioecological model to explore how a multitude of systems influence the maternal mental illness, infant growth and development. The findings of this study show the importance of the various bioecological model Isystems within rural areas towards the growth and development of a child during the postpartum period. The interactions between the microsystem (the personal characteristics of both the mother and the infant), mesosystem (social network, especially the social support system), macrosystem (community leaders such as the VHTs) and the chronosystem (changes in growth and development that occur at baseline and follow-up points such as in this study) all account for maternal mental illness and infant growth and development outcomes. Due to the high prevalence of maternal mental illness found in this study, mothers who have given birth are at high risk, especially in rural settings. These findings further indicate that a number of predictors in rural settings interact to affect the prevalence of maternal mental illness and its role in affecting infant growth and development.

The findings did not show an association between infant growth and psychomotor development and maternal mental illness, contrary to what most findings assert. The study findings support the notion that rather than a single episode of maternal mental illness,

chronic maternal mental illness could be a possible explanation for poor infants' growth and development. Social support and relationship discord are important predictors of maternal mental illness and poor infant growth and development during the postpartum period. Furthermore, apart from maternal mental illness, other confounding and predictor variables should be investigated in line with infant growth and development. The Luganda versions of the EPDS and SRQ-20 are highly reliable tools for screening maternal mental illness in the rural areas of Uganda.

Chapter 6: Conclusion

6.1 Introduction

This final chapter is divided into six parts. The first section provides an introduction, while the second section focuses on the study's contribution to new knowledge in this field. The third section concentrates on the study's implications for clinical practice in Uganda and global mental health. The fourth section focuses on the limitations and strength of the study. The fifth section focuses on recommendations for intervention and research. The last section focuses on the conclusions drawn from this research.

6.2 Implications for Clinical Practice in Uganda and Global Mental Health

The relationship between maternal mental health and infant growth and development is complex and has several implications for policy and research development within the field of global mental health. The findings of this study have implications not only for Uganda but also for other countries across the globe.

First, maternal mental health treatment and intervention programmes must be multipronged so that they focus not only on the mothers but also include interventions for the infants, the spouses and other significant caregivers during the postpartum period where infants are at risk. Since,m maternal mental health may have an impact on all family members and other household members; therefore, interventions aiming at supporting the mothers may be more effective if they are simultaneously promoting the inclusion of other stakeholders within the same household. However it should be noted that this particular research focused only on the mother and their infants and did not measure the mental health of other household members. Futher research should be conducded focusing on how

maternal mental illness affects household members and how broader interventions can be implemented.

Furthermore, there is a need for governments and NGOs to note that promoting the rights of mothers living with mental illness requires the mobilisation of the public. This public intervention needs to focus on and address the negative and stigmatising norms and beliefs surrounding childbirth and mental illness, especially in LMICs.

It is clear from this research that more relevant research should be conducted in Uganda, since it is crucial to understand both maternal and infant mental health, especially in the rural setting. An initial literature search revealed only three articles (Ainsworth, 1979; Geber & Dean, 1957; Singla et al., 2015) to be relevant to infant psychomotor functioning in Uganda. Two articles (Ainsworth, 1979; Geber & Dean, 1957) were not related to maternal mental illness. Many of the publications concerning infant psychomotor functioning in Uganda do not focus on the predictors of infant psychomotor functioning and their effects on the infant. This research may help Ugandan and global policy makers and health professionals understand the problem of maternal mental health and its effects on growth and development of infants, thereby framing beneficial policies. The impact of maternal mental illness on infants, mothers, spouses and other people needs to be systematically assessed. The methodological issues and differences facing researchers from both LMICs and HICs need to be developed and streamlined in light of the different research outcomes. It should be noted, however, that during the research respondents may sometimes present with culturally complex, clinical manifestations which may call for the exploration and usage of a mixed-methods research design.

Although some studies have suggested that research rarely influences policy, the association between the two in Uganda is relatively linear, especially when it comes to adopting new-born care practices (Mbonye et al., 2012; Rubayet et al., 2012). This can

therefore, also be inferred for maternal and infant mental health. The evidence provided by this research and the documented policy gap in global and national public health discourse on maternal mental health may result in the development of policies that are strategically designed to reduce the risk of maternal mental illness and its effects on infant growth and development.

This study has implications for policy makers. Existing and future policies regarding maternal and child health interventions should integrate psychosocial components. These policies may include counselling for the mother who is at risk and enhancement of maternal sensitivity towards the infant in order to prevent detrimental effect on the growth and development of infants. These findings may be used by the Ministry of Health in Uganda for decision making, planning and tracking the impact of policies and programmes on improving maternal mental health, infant growth and development.

Health services delivery strategies and allocation of resources towards maternal and infant mental health should be considered as a strategy towards prevention of mental illness in this population. Due to the nature of the rural setup in Uganda, the sparsely populated areas and isolated homes may decrease the mother's accessibility to mental health services. Hence the need for VHTs to receive training in mental health screening and first line therapeutic services. This is in line with Kagee et al., (2013) argument for task-shifting screening activities. These task-shifted activities could reduce and help alleviate barriers such as lack of trust, dissatisfaction amongst the service recipients and judgment or stigma through mass sensitisation. Using the EPDS and SRQ-20 that have been validated for the Ugandan rural setting, the VHTs and other community health workers will be able to screen for maternal mental illness symptoms and identify mother-infant dyads that may be at risk.

The high levels of maternal mental illness have implications for clinical service delivery in the rural setting. Maternal mental health illness may affect the woman's ability to

cognitively process information and may affect the mother's ability to seek health services (Logsdon, Wisner, & Pinto-Foltz, 2006). Community-based intervention should involve early screening and referral to health centres by the VHTs. This will provide better health for the mothers and their infants. Improving maternal mental health during the postpartum period could have both preventive and protective effects not only for the infants but also for the mother and the entire family.

6.3 Contribution to the New Knowledge in the Public Mental Health Field

The objective of this PhD project was to carry out a comprehensive longitudinal study to investigate the relationship between maternal mental illness, infant growth and psychomotor development of infants. However it should be noted that this study only provided information for the first 6 months postpartum rather than focusing on the first 1000 days. This research provides new knowledge in the following areas: prevalence and determinants of maternal mental illness in rural Uganda; the association of postpartum maternal mental illness with infant growth and development in rural Uganda; and the effectiveness of EPDS and SRQ-20 as screening tools to detect maternal mental illness in rural Uganda.

This study greatly contributes to obtaining new insights into the most important areas of maternal mental health and is one of the few studies to focus on postpartum GAD and comorbidity of depression and GAD in a rural setting. This research contributes to understanding maternal mental illness and infant psychomotor functioning and growth in Uganda and internationally. The findings narrow the knowledge gap about the relationships between maternal mental health illness and infant growth and development.

The study findings indicate that maternal mental illness is not a single predictor of the infant's growth or development but that other compounding factors may affect these relationships. The study also focused on the role of psychosocial factors as far as maternal

mental illness is concerned. Psychosocial factors such as relationship discord, poverty and social support were investigated. It should further be noted that this is one of the first such comprehensive longitudinal study designs to study maternal mental illness in the postpartum period in rural Uganda. This study contributes novel knowledge on how psychosocial factors can predict maternal mental illness. It also contributes to the understanding of maternal mental illness as a global issue and its effects on infant growth and development, especially in LMICs.

This finding has important inferences for both families and health care practitioners, since this research points to the development of strategies for improvement of maternal mental health and infant development, especially within the rural setting. There is a need for development of community-based interventions and programmes that focus on prevention of maternal mental illness and related problems across different cultures.

This research has illustrated that there are high prevalence of maternal depression, maternal GAD, maternal comorbidity of depression and GAD and maternal psychological distress at both the baseline and follow-up assessment points in rural Uganda. Many of the women suffer from mental illness during the postpartum period, as other researchers have shown. In many cases, these mental illnesses may go undetected and sometimes untreated. Therefore, effective screening tools are of paramount importance, especially in rural settings where mothers may not even go to health centres for check-ups. . However, in the absence of a system that can accept referrals and provide treatment, screening may not be of much use. Its therefore advisible that intervention system such as Interpersonal Pychotherapy for Groups which has been used in masaka District, Uganda and task sharing interventions for maternal mental illness (Bass et al., 2006; Bolton et al., 2004; Lund et al., 2015, 2014; Patel, Araya, & Bolton, 2004).

Although the EPDS and SRQ-20 are two of the most widely used tools both globally and in Uganda, no research in Uganda has validated them against the gold standard in the rural setting where the majority of the population lives. Therefore, one of the most important contributions of this research is the validation of using both the EPDS and SRQ-20 in rural settings, especially since in most of these settings the resources for using the gold standard are scarce.

6.4 Strengths and Limitations of the Study

6.4.1 Strengths of the Study

The use of a community sample allowed the researcher to study different aspects of maternal mental illness and infant growth and development. This enhanced the quality of the study and implies that the results can be used to plan for mental health interventions within Ugandan communities and can be disseminated in similar settings.

Secondly, a longitudinal study design was used in this research. The participants were assessed at six weeks and six months postpartum, which enabled the research to carry out multiple assessments at different study points. This enabled the researcher to follow up and study the participants at two study points and compare the variables from two different time points.

The use of a large sample size with good retention and attrition of 10.77% between baseline and follow up is another strength of this study. The large sample size enables the study to have results that are reliable, generalisable and are more representative of the study population.

Furthermore, unlike most research on maternal mental illness that is carried out in urban settings, this research focused on a rural setting where most of the mothers in Uganda are living. This helped highlight the prevalence of maternal mental illness and its association

to infant growth and infant psychomotor functioning in a socioeconomically disadvantaged population and setting.

Another major strength of the study was the types of measures and tools used in the study. The study used the SCID as a gold standard; it has substantial advantages over screening tools since it is a diagnostic tool. However, the study also used standardised tools such as the EPDS and SRQ-20. These tools are commonly used as screening tools for maternal mental health during the postpartum period in both health care centres and research settings.

Furthermore, the study used two tools developed in sub-Saharan Africa: the Kilifi Developmental Inventory (KDI) and the Developmental Milestones Checklist (DMC) were used to measure psychomotor development. Although these tools were developed in Kenya, they were preferred over the commonly used Western tools because of their cultural appropriateness to the Ugandan setting. Furthermore, another strength was the fact that the KDI and DMC administrators were blinded to the maternal mental illness of the respondents at both assessment points. This reduced prior-knowledge bias; the KDI and DMC administrators did not know which mother was depressed or anxious or even psychologically distressed at the baseline and follow-up study points.

6.4.2 Limitations of the Study

Although the study had new and important results, it should be noted that it had some limitations. The use of community samples could have affected the findings since the selection of the mothers was dependent upon the VHT. Also, the benefit of being compensated for the time spent during the interview and the stuffed toy given to the infant could have motivated the participants to give answers inclined toward showing distress or social desirability.

The order in which the instruments were administered during the interviews could have also affected the results. For instance, the participants were interviewed using the EPDS first and then the SRQ-20 and later the gold standard, which could have improved the performance of the SRQ-20 over the EPDS. The research should have used a randomised presentation of instruments in order to reduce the superiority of one instrument over the other. Furthermore, the gold standard was administered by only one clinician. If there had been another clinician, there would have been a possibility of having inter-rater reliability for the diagnoses.

The infants were tested at different times in different environmental settings. There was no standardised testing environment or time. The mother-infant dyads were interviewed in their home compounds and some homes had closed-off compounds while others did not. As far as time of day, some of the infants were tested in the morning while others were tested in the afternoon. These factors could have brought in extraneous variables which could have affected the results. Furthermore infant height was not measured using a standard board which gives more accurate measures.

6.5 Recommendations for Intervention and Research

From the study findings, a number of recommendations can be suggested for further intervention and research. First and foremost it should be noted that this study used a longitudinal research design which has a number of advantages, such as studying cause and effect associations over a long period of time, its ability to provide results with high levels of validity, and the possibility of studying developmental trends. However, there is a need for a mixed research design study where both qualitative and quantitative methods should be used in future studies (Almalki, 2016).This will enable a comprehensive study of variables through triangulation of both qualitative and quantitative methods.

Further research covering a larger and more diverse sample should be conducted. The research findings could be more generalisable if a bigger sample size can be obtained in several rural areas in Uganda. A large and more diverse sample size will also help establish prevalence for maternal mental health with greater precision in both prenatal and postpartum periods.

Having two phases 18 weeks apart limited the in-depth study of the variables. A more comprehensive study that follows the respondents from pregnancy into the postpartum period until a later age of the child is recommended. This would help compare a number of factors and predictors over a long duration and help in developing a comprehensive understanding of how changes in maternal mental illness affect infant growth and development (Louis & Platt, 2011; Venkatesh, Vindhya, & Nath, 2019).

The role of the social support systems towards child growth and development should be investigated further, especially within the Ugandan context. While mothers may suffer from depression and GAD, the role of other caregivers within the home should not be underestimated. Research investigating how other caregivers within the home may serve as a buffer should be carried out.

With the high rates of maternal mental disorders reported in this study and in other LMIC and resource-constrained contexts, routine screening of mothers, especially when they take the children for immunisation at public health facilities, should be done (Kagee et al., 2013). The screening tools also need to be more specific so the rate of treating mothers who are not suffering from mental illness is reduced (Kagee et al., 2013). A two-tier method of assessment should be adopted. A mothers can be screened at both community and health facility levels and those scoring with elevated scores on the screening tools can be followed up with a diagnostic interview. Mothers who meet criteria for depression or GAD can then

be referred for treatment in the health centers or hospitals. This kind of triaging can limit the number of false positives and avoid overwhelming the public mental health system.

Although there may be efforts towards implementing preventive services for mental illness within the rural areas, there is a need for the development of strong maternal mental health services and networks within the rural community (Heron et al., 2004). This need is reinforced by the high prevalence in this study and will further help to elucidate the different risk mechanisms to benefit not only the mothers but also the infants' and the mothers' families.

Given the above results, more research should be conducted to further confirm the effects of maternal behaviour as an intermediary variable to the effects of GAD on psychomotor functioning. More research should also be conducted on the role of postnatal care as an intervention for maternal mental illness in Uganda.

6.6 Conclusions

This longitudinal community study highlights the impact of maternal mental illness on both infant growth and development in rural and low-income communities. It also focused on some of the key predictors of maternal mental illness in the rural Masaka district in Uganda. High prevalence of maternal mental illness was found in this study. It should be noted that maternal mental illness is a public health concern which not only affects mothers but also their infants and other people who may be living with them. It does not only affect the current generation, but it extends its effects to the next generation. Therefore, there is a need to conduct further research focusing on chronic maternal mental illness that stretches from the prenatal period to early childhood. The findings further suggest that infant growth and psychomotor development are affected by a number of factors apart from maternal mental illness. Therefore, there is a need to assess other predictors and confounding variables and the role they play during the postpartum period.

The findings also have implications not only for mental health service provision but also for prevention of maternal mental illness and its consequences for the infant in rural settings and in LMICs. The findings of this study underpin the importance of mental health workers focusing on both the mothers and infants during the postpartum period. The need for screening for maternal mental illnesses during the postpartum period is highlighted in this study. This could be extremely useful in the prevention of these illnesses during this period and could reduce maternal mental illness effects on the infants. The Luganda versions of the EPDS and SRQ-20 were found to be reliable, valid and effective screening tools for maternal mental illness in rural Masaka Uganda. Since this was a community-based study, the VHTs can be trained in the administering of these tools to ensure a wider coverage of the population. However, the focus should not only be on the screening processes, but it should also look at the various predictors within the rural community with the view to improving maternal and infant health. Community interventions and prevention approaches should be critically assessed and implemented in order to curb maternal mental illness and its effects that might be intergenerational, especially in sub-Saharan Africa.

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Appendices

Appendix A: The Sociodemographic Questionnaire

Date of Interview:_____

Mother-infant Research ID No.:_____

Questionnaire: No_____

Section A:

1. How old are you?_____
2. How old is your husband?_____
3. What is your tribe?_____
4. What is your husband's tribe?_____
5. What is your marital status?_____

   Married Single Divorced/Separated

6. What is your education level?

   Did not go to School ☐ Primary ☐ Secondary ☐ Tertiary/University ☐

7. What is your husband's level of education?
8. Did not go to School ☐ Primary ☐ Secondary ☐ Tertiary/University ☐
9. How long have you stayed with your spouse?_____
10. What is your occupation?_____
11. What is your spouse's occupation_____
12. Did you and your husband plan on having this child? Yes ☐ No ☐
13. How was this baby delivered? Normal birth ☐ Caesarean Section ☐
14. How long were you in labour?_____
15. What is the gender of the infant? Male ☐ Female ☐
16. What was the infant's birth weight?_____

17. What was the infant's birth height?_____

18. During these 6 weeks has the baby had any illnesses? Yes ☐ No ☐

19. If yes, how many times?_____

20. Do you know what was the child suffering from?

Malaria or fever

Diarrhoea

Other Illness

21. Number of episodes

Malaria or fever

Diarrhoea

Other Illness

22. Has the child ever been hospitalised?

23. If yes, for how long?

24. Are you exclusively breast feeding this child? Yes ☐ No ☐

25. Are you using any supplementary breast feeding? Yes ☐ No ☐

26. On average how many times do you feed the child in a day?_____

27. How many live births have you had?_____

28. How many children do you have in total?_____

Number of males _____ Number of females _____

29. What was the birth position of the infant?_____

30. If this is not your 1st born, how old is the child before this one? _____

31. Do all the school-age children attend school? 1. Yes 2. No

32. If they attend school, what type of school do they attend?

a) Tertiary (university/College)
b) Private secondary school
c) Government-aided secondary

d) Universal Primary school
e) Private Primary school
f) Other

33. If they do not attend school, why?

a) Cannot afford school fees and other school requirements
b) Children do not want to go to school
c) Lack of schools in the area
d) Other (specify)……

Section B: Asset Registry and Poverty Assessment

1) What is the main source of food for the household?
   a) All food is produced on farm by household
   b) Partly produced by household and partly bought
   c) All is bought
   d) Household members work for all the food
   e) Other
2) Do you have enough food throughout the year?
   Yes No
3) What kind of work do you do?
   1. Agricultural labour
   2. Household work
   3. Construction
   4. Grazing of livestock
   5. Shop keeping
   6. Other (specify)…….
4) How are you paid?
   1. Monthly wage
   2. Daily rate
   3. In kind
   4. Other (specify)
5) What is the monthly household income, net income after taxes and fringe benefit deductions?
6) Does the family have any means of transport?
   1. Yes
   2. No
7) If Yes, what means of transports?
   1. Motor vehicle
   2. Motor cycle
   3. Bicycle
   4. Canoe/boat
   5. Donkey
   6. Other
   7. (specify)
8) What type(s) of energy do you use in your home for cooking?
   1. electricity
   2. bottle gas (LPG or propane)
   3. coal
   4. firewood

5. kerosene
6. solar
7. other (specify)…….

9) Which of the following appliances do you use at home?
    1. Radio
    2. Television
    3. Mobile
    4. phone
    5. electric kettle
    6. electric iron
    7. refrigerator
    8. other (specify)

10) Does this household own any of the following:
    1. Land in acres
    2. Buildings for rent
    3. Agricultural equipment (tractor/ Ox plough)
    4. Livestock (list and give numbers)
        a. Cows……
        b. Goats…….
        c. Sheep……..
        d. Other (specify)……..

11) Type of House

Brick Walls		**Mud and Reeds Walls**	
Clay Tiled roof		**Clay Tiled roof**	
Iron Sheet roof		**Iron Sheet roof**	
Grass Thatched Roof		**Grass Thatched Roof**	
Other		**Other**	

12) Do you rent or own the place where you are living?

13) How many bedrooms are there in your home?

14) How many people live there?

15) How many people are working in your household?
    1. one
    2. two
    3. three
    4. four
    5. more than four

Appendix B: SCID-I-RV/NP- Depression

?=inadequate Information 1=absent or false 2=subthreshold 3=threshold or true

CURRENT MAJOR DEPRESSIVE EPISODE	**MDE CRITERIA**				
Now I am going to ask you some more questions about your mood	A. Five (or more) of the following symptoms have been presented during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood, or (2) loos of interest or Pressure.				
In the last month ……has there been a period of time when you were feeling depressed or down most of the day nearly every day? (What was that like) IF YES: How long did it last? (As long as 2 weeks)	(1) Depressed mood most of the day, nearly every day, as indicated either by subjective report (e.g. feels sad or empty) or observation made by others (e.g. or adolescents, can be irritable mood.	?	1	2	3
…. What about losing interest or pleasure in things you usually enjoyed? IF YES: Was it nearly every day? How long did it last (As long as 2 Weeks?)	(2) Markedly diminished interested or pleasure in all or most all activities most of the day, nearly every day (as indicated either by subjective account or observation made by others)	?	1	2	3
		IF NEITHER ITEM (1) NOR ITEM (2) IS CODED "3" GO TO ***PAST MAJOR DEPRESSIVE EPISODE, *** A.12			
	NOTE: WHEN RATING THE FOLLOWING ITEMS CODE "1" IF CLEARLY DUE TO A GENERAL MEDICAL CONDITION, OR TO MOOD- INCONGRUENT DELUSIONS OR HALLUCINATION				

FOR THE FOLLOWING QUESTIONS, FOCUS ON THE WORST 2 WEEKS IN THE PAST MONTH (OR ELSE THE PAST 2 WEEKS IF EQUALLY DEPRESSED FOR ENTIRE MONTH).

During this (2 WEEK PERIOD)…

How was your appetite? (What about compared to your usual appetite?) (Did you have to force yourself to eat? (Eat Less/More than usual? (Was that nearly every?) Did you lose or gain any weight) (How much?) Where you trying to lose/ gain Weight?)	(3) Significant weight loss when not dieting, or weight gain (e.g. .., a change of more than 5% of body weight in a month) or decrease or increase in appetite nearly every day. Note: in children, consider failure to make expected weight gains. Check if _____Weight loss or decreased appetite _____Weight gain or increased appetite	?	1	2	3
… How were you sleeping? (Trouble falling asleep waking frequently, trouble staying asleep, waking too early, OR sleeping too much? How many hours a night compared to usual? Was that nearly every night?)	(4) Insomnia or hypersomnia nearly every day. Check if: _____Insomnia _____Hypersomnia	?	1	2	3
..... Were you so fidgety or restless that you were unable to sit still (Was it so bad that other people noticed it? What did they notice? Was that nearly every day?)	(5) Psychomotor agitation or retardation nearly every day (observable by others not merely being slowed down)	?	1	2	3
IF NO: What about the opposite-- talking or moving more slowly than is normal for you? (Was it so bad that other people noticed it? What did they notice? Was that	NOTE: CONSIDER BEHAVIOR DURING THE INTERVIEW Check if: _____Psychomotor or agitation _____Psychomotor Retardation.				

nearly every day?)					
…What was your energy like? (Tired all the time? Nearly every day?)	(6) Fatigue or loss of energy nearly every day	?	1	2	3
During this time… How did you feel about yourself? (Worthless?) (Nearly every day?) IF NO: What about feeling guilt about things you had done or not done? (Nearly every day?	(7) Feelings of Worthless or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick) NOTE: CODE "1" OR "2" IF ONLY LOW SELF-ESTEEM. Check if : _____Worthlessness _____Inappropriate guilt	?	1	2	3
….Did u have trouble thinking or concentrating? (What kinds of things did it interfere with?) (Nearly every day?) IF NO: Was it hard to make decisions about everyday things? (Nearly every day)	(8) Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others) Check if : _____Diminished ability to think _____Indecisiveness	?	1	2	3
…Were things so bad that you were thinking a lot about death or that you would be better off dead? What about thinking of hurting yourself? IF YES: Did you do anything to hurt yourself?	(9) Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide. NOTE: CODE"1" FOR SELF-MUTILATION W/O SUICIDAL INTENT. Check if : _____Thoughts of own death _____Suicide ideation _____Specific plan _____Suicide attempt	?	1	2	3

	AT LEAST FIVE OF THE ABOVE SXS[A(1-9)] ARE CODED “3” AND AT LEAST ONE OF THESE IS ITEM (1) OR (2) NOTE: DSM-IV Criterion B(i.e., does not meet criteria for a mixed episode has been omitted from the SCID		1		3
IF UNCLEAR: Has (DEPRESSIVE EPISODE/OWN WORDS) made it hard for you to do your work, take care of things or get along with other people	(C)The symptoms cause clinically significant distress or impairment in social, occupational, or other important	?	1	2	3
Just before this began, were you physically ill? IF YES: What did the doctor say? Just before this began, were you using any medications? IF YES: Any change in the amount you were using Just before this began, were you drinking or using any street drugs?	(D) The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, medication) or to a general medical condition. IF THERE IS ANY INDICATION THAT THE DEPRESSION MAY BE SECONDARY (I.E., DIRECT PHYSIOLOGICAL CONSEQUENCE OF A GMC OR SUBSTANCE GO TO *GMC/SUBSTANCE ,* A.43 AND RETURN HERE TO MAKE A RATING OF “1” OR “3” Etiological general medical conditions include: Degenerative neurological illnesses (e.g., Huntington’s disease, multiple sclerosis), cerebrovascular disease (e.g., stroke), metabolic conditions (e.g., Vitamin B-12 deficiency, Wilson’s disease), endocrine conditions (e.g., hyperthyroidism), viral or other infections, and certain cancers (e.g., carcinoma of the pancreas).	?	1		3

	Etiological substances include: alcohol, amphetamines, cocaine, hallucinogens, inhalants, opioids, phencyclidine, sedatives, hypnotics, anxiolytics. Medications include antihypertensives, oral contraceptives, corticosteroids, anabolic steroids, anticancer agents, analgesics, anticholinergics, cardiac medications.		
Did this begin soon after someone close to you died?	E. Not better accounted for by bereavement, i.e., after the loss of a loved one, the symptoms persist for longer than 2 months or are characterized by marked functional impairment, morbid preoccupation with worthlessness, suicidal ideation, psychotic symptoms, or psychomotor retardation. NOTE: CODE "3" IF EITHER NOT FOLLOWING THE LOSS OF LOVED ONE OR IF BEREAVEMENT IS COMPLICATED BY MAJOR DEPRESSIVE EPISODE. CODE "1" IF SIMPLE BEREAVEMENT	1	3
	MAJOR DEPRESSIVE EPISODE CRITERIA A,C,D AND E ARE CODED "3"	1	3
How many separate times in your life have you been (depressed/ OWN WORDS) nearly every day for at least 2 weeks and had several of the symptoms that you described, like (SXS OF WORST EPISODE)	Total number of Major Depressive Episodes, Including current (CODE 99 IF TOO NUMEROUS OR INDISTINCT TO COUNT) NOTE: TO RECORD DETAILS OF PAST EPISODES, GO TO J.9 (OPTIONAL)		

Appendix C: SCID-I-RV/NP- GAD

?=inadequate Information 1=absent or false 2=subthreshold 3=threshold or true

***GENERALIZED ANXIETY DISORDER* (CURRENT ONLY)**	**GAD CRITERIA**				
Do you also worry a lot about bad things that might happen? IF YES: What do you worry about? (How much do you worry about [EVENTS OR ACTIVITOES]?)	A. Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least 6 months, about a number of events or activities (such as work or school performance).	?	1	2	3
During the last 6 months, would you say that you have been worrying more days than not?					
When you're worrying this way, do you find that it's hard to stop yourself?	B. The person finds it difficult to control the worry.	?	1	2	3
When did this anxiety start? COMPARE ANSWER WITH ONSET OF MOOD OR PSYCHOTIC DISORDER	F (2). Does not occur exclusively during the course of a Mood, Disorder, Psychotic Disorder, or a Pervasive Developmental Disorder	?	1		3

Now am going to ask you some questions about symptoms that often go along with being nervous.	C. The anxiety and worry are associated with three (or more) of the following six symptoms (with at least some symptoms present for more days than not for the past 6 months):				
Thinking about those periods in the past 6 months when you're feeling nervous or anxious	Note: Only one item is required in children.				
..... do you often feel physically restless – can't sit still? .....do you often feel keyed up or on edge?	(1) Restlessness or feeling keyed up or on edge	?	1	2	3
.....do you often tire easily?	(2) Being easily fatigued	?	1	2	3
..... do you have trouble concentrating or does your mind go blank?	(3) Difficulty concentrating or mind going blank	?	1	2	3
..... are you often irritable?	(4) Irritability	?	1	2	3
.....are your muscles often tense?	(5) Muscle tension	?	1	2	3
..... do you often have trouble falling or staying asleep?	(6) Sleep disturbance (difficulty falling or staying asleep, or restless unsatisfying sleep)	?	1	2	3
	ATLEAST THREE "C" SXS ARE CODED "3"				

CODED BASED ON PREVIOUS INFORMATION	D. The focus of the anxiety and worry is not confined to the features of another Axis I Disorder, e.g., the anxiety or worry is not about having a panic attack (as in Panic Disorder), being embarrassed in public (as in social Phobia), being contaminated (as in Obsessive Compulsive Disorder), being away from home or close relatives (as in Separation Anxiety Disorder), gaining weight (as in Anorexia Nervosa), having multiple physical complaints (as in Somatization Disorder), or having a serious illness (as in Hypochondriasis), and the anxiety or worry do not occur exclusively during Posttraumatic Stress Disorder.	?	1		3
IF UNCLEAR: what effect has the anxiety, worry, or (PHYSICAL SYMPTOMS) had on your life? (Has it made it hard for you to do your work or be with your friends?)	E. The anxiety, worry, or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning	?	1	2	3
Just before you began having this anxiety, were you taking any drugs, caffeine, diet pills or other medicines? (How much coffee, tea or caffeinated soda do you drink a day?) Just before these problems began, were you physically ill? IF YES: what did the doctor say?	F. Not due to the direct physiological effects of a substance (e.g., a drug of abuse, medication) or to a general medical condition.	?	1		3

Etiological general medical conditions include: hyper- and hypo-thyroidism, hypoglycemia, hyper-parathyroidism, pheochromocytoma, congestive heart failure, arrhythmias, pulmonary embolism, chronic obstructive pulmonary disease, pneumonia, hyperventilation, B-12 deficiency, porphyria, CNS neoplasms, vestibular dysfunction, and encephalitis.

Etiological substances include:

Intoxication with central nervous stimulants (e.g., cocaine, ampheta-mines, caffeine) or cannabis, hallucinogens, PCP, or alcohol or withdrawal from central nervous system depressants (e.g., alcohol, sedatives, hypnotics) or from cocaine.

GENERALIZED ANXIETY CRITERIA A,B,C,D,E AND F ARE CODED “3”	1	3

Appendix D: Edinburgh Postnatal Depression Scale

As you have recently had a baby, we would like to know how you are feeling. Please circle the appropriate option which come closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today.

In the past 7 days:

1. I have been able to laugh and see the funny side of things
    a) As much as I always could
    b) Not quite so much now
    c) Definitely not so much now
    d) Not at all
2. I have looked forward with enjoyment to things:
    a) As much as I ever did
    b) Rather less than I used to
    c) Definitely less than I used to
    d) Hardly at all
3. I have blamed myself unnecessarily when things went wrong:
    a) Yes, most of the time
    b) Yes, some of the time
    c) Not very often
    d) No, never
4. I have been anxious or worried for no good reason
    a) No, not at all
    b) Hardly ever
    c) Yes, sometimes
    d) Yes, very often
5. I have felt scared or panicky for no very good reason
    a) Yes, quite a lot
    b) Yes, sometimes
    c) No, not much
    d) No, not at all
6. Things have been getting on top of me
    a) Yes, most of the time I haven't been able to cope at all
    b) Yes, sometimes I haven't been coping as well as usual
    c) No, most of the time I have coped quite well
    d) No, I have been coping as well as ever
7. I have been so unhappy that I have had difficulty sleeping
    a) Yes, most of the time
    b) Yes, sometimes
    c) Not very often
    d) No, not at all

8. I have felt sad or miserable
    a) Yes, most of the time
    b) Yes, quite often
    c) Not very often
    d) No, not at all
9. I have been so unhappy that I have been crying
    a) Yes, most of the time
    b) Yes, quite often
    c) Only occasionally
    d) No, never
10. The thought of harming myself has occurred to me
    a) Yes, quite often
    b) Sometimes
    c) Hardly ever
    d) Never

Appendix E: The Self-Reporting Questionnaire (SRQ-20; WHO, 1994)

	Statement		
1.	Do you often have headaches	Yes	No
2.	Is your appetite poor	Yes	No
3.	Do you sleep badly	Yes	No
4.	Are you easily frightened	Yes	No
5.	Do your hands shake	Yes	No
6.	Do you feel nervous tense or worried	Yes	No
7.	Is your digestion poor	Yes	No
8.	Do you have trouble thinking clearly	Yes	No
9.	Do you feel unhappy	Yes	No
10.	Do you cry more than usual	Yes	No
11.	Do you find it difficult to enjoy your daily activities	Yes	No
12.	Do you find it difficult to make decisions	Yes	No
13.	Is your daily work suffering	Yes	No
14.	Are you unable to play a useful part in life	Yes	No
15.	Have you lost interest in things	Yes	No
16.	Do you feel that you are a worthless person	Yes	No
17.	Has the thought of ending your life been on your mind	Yes	No
18.	Do you feel tired all the time	Yes	No
19.	Do you have uncomfortable feelings in your stomach	Yes	No
20.	Are you easily tired	Yes	No

Appendix F: The Relationship Dynamics Scale (RDS; Stanley & Markman, 1997)

How often do you and your mate or partner experience the following:
1 = Never or almost never
2 = Once in awhile
3 = Frequently

Statement	Never Or almost never	Once in awhile	Frequently
1. Little arguments escalate into ugly fights with accusations, criticisms, name calling, or bringing up past hurts.	1	2	3
2. My partner criticizes or belittles my opinions, feelings, or desires.	1	2	3
3. My partner seems to view my words or actions more negatively than I mean them to be.	1	2	3
4. When we have a problem to solve, it is like we are on opposite teams.	1	2	3
5. I hold back from telling my partner what I really think and feel.	1	2	3
6. I think seriously about what it would be like to date or marry someone else.	1	2	3
7. I feel lonely in this relationship.	1	2	3
8. When we argue, one of us withdraws, that is, doesn't want to talk about it anymore; or leaves the scene.	1	2	3

Appendix G: The Multidimensional Scale of Perceived Social Support

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Statement	Very Strongly Disagree	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree	Very Strongly Agree
1. There is a special person who is around when I am in need.	1	2	3	4	5	6	7
2. There is a special person with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
3. My family really tries to help me.	1	2	3	4	5	6	7
4. I get the emotional help and support I need from my family.	1	2	3	4	5	6	7
5. I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7
6. My friends really try to help me.	1	2	3	4	5	6	7
7. I can count on my friends when things go wrong.	1	2	3	4	5	6	7
8. I can talk about my problems with my family.	1	2	3	4	5	6	7
9. I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
10. There is a special person in my life who cares about my feelings.	1	2	3	4	5		7
11. My family is willing to help me make decisions.	1	2	3	4	5	7	7
12. I can talk about my problems with my friends.	1	2	3	4	5	6	7

Appendix H: Kilifi Developmental Inventory (KDI)

INFANT / TODDLER STUDY

STUDY NUMBER [_**I**_][_**T** _][_**S** _][__][__][__]

CHILD'S NAME: [_____] [_][_]

TIME ARRIVED AT HOME: [_____]

ASSESSMENT DATE: [__][__]/[__][__]/[__][__]

AGE AT ASSESSMENT: [____] Months [____] Days

ASSESSOR INITIALS [____][____]

OBSERVER INITIALS [____][____]

Test session observations

Health
Mood a) **Crying/ inconsolable** b) **Occasional crying** c) **Changeable (mood swings)** d) **No visible emotions** e) **Occasional smiles** f) **Smiling/laughing [____]**
Child's activity level **a)** Unarousable **b)** Sleepy can hardly be awaken **c)** Sleepy but easily awake **d)** Does not spontaneously engage in activity **e)** Awake but loses interest **f)** Active and maintains interest **[____]**
Child's interaction with the assessor a) Avoidant and withdrawn b) Clings to family member c) Hesitant (when approached will accept reluctantly) d) Difficult to engage in tasks e) Inappropriate approaches to assessor f) Friendly **[____]**
Any unusual events during testing

Weight: **[__ _._]kg**

Height: **[____.___]cm**

Head circumference: **[____.___]cm**

Mid-upper arm circumference: **[____. ___]cm**

Instruction:
Brief the person accompanying the child on the tasks and the role they are expected to play during the assessment.

START TIME [____:____] END TIME [____:____]

MOVING Yes/No		
LM 01	Stands with support	
LM 02	Stands without support	

PLAYING WITH THE BALL		
Code/score Yes/No		
EH 01	**THROWS** and **CATCHES** ball Highest string achieved (3 games)	
EH 02	**Releases a ball** purposefully	
EH 03	Throws a ball towards someone	
EH 04	**Catches** a ball using arms and hands	
EH 05	Catches a ball using hands only	
LM 03	**Can kick** a ball from stationary position	
LM 04	Can kick a moving ball	

MOVING		
Code/score Yes/No		
LM 05	**Walks** when held with one hand	
LM 06	Walks without help	
LM 07	**Jumps** with two feet together, holding on to person's hand	
LM 08	Jumps with two feet together unsupported both feet leave the ground	
LM 09	**Stands on one leg**, without support for 10 – 20 seconds	
LM 10	Stands on one leg, without support for 21 seconds+	
LM 11	**Walk on tip toes** for 3 or more steps	
LM 12	Walk on tip toes for length of mat	
LM 13	**Walks backwards** with support or for less than length of mat	
LM 14	Walks backwards alone for length of mat	
LM 15	**Walks along line** heel to toe, arms out for 3 steps	
LM 16	Walks along line heel to toe, arms out for length of mat	

LM 17	Walks on side of feet	
LM 18	Can **pull** self onto platform	
LM 19	Can climb straight onto platform	
LM 20	**Jumps off** platform with support	
LM 21	Jumps off platform and lands on both feet	
LM 22	**Hops on one** leg on spot	
LM 23	Hops on one leg for length of mat	

Code/score Yes/No		
LYING AND STANDING		
LM 24	Lifts upper body while lying on stomach	
LM 25	Sits with support	
LM 26	Can sit steadily/ without support	
LM 27	No head lag in sitting position	
LM 28	Can reach out and return to sitting position	
LM 29	**Rolls** from side to back	
LM 30	Rolls from side to side	
LM 31	**Moves from lying** to sitting pushing up with hands	
LM 32	Moves from lying to sitting not using hands	
LM 33	**Moves from sitting** to standing rolling over and up	
LM 34	Moves from sitting to standing not using hands	
LM 35	Can sit down steadily (from a standing position)	

Code/score Yes/No		
VISION: RING AND RED TASSEL		
EH 06	Reaches for dangling ring	
EH 07	Takes dangling ring	
EH 08	Follows red tassel with eyes/attempts to grasp	
EH 09	Grasps red tassel successfully	
EH 10	Can hold and examine object (ring, bear etc.)	
EH 11	Passes object from hand to hand	
BUTTON		
EH 12	Can do up button with adult holding one piece of cloth	
EH 13	Can do up button alone	

BLOCK TOWER			
A. Can retain cube in either hand when given	**B**. Retains one cube When second offered	**C**. Picks cube up from mat	**D**. Mature (radial) grasp
E. Can hold 2 cubes in	**F**. Retains 2 cubes when third offered	**G**. Releases one cube on top of	**H**. Builds tower 3-4 cubes

one hand		another	
I. Builds tower 5-6 cubes	**J**. Builds tower 7-8 cubes	**K**. Builds tower 9-10 cubes	**L**. Builds tower 11-12 cubes
EH 14	Number of boxes ticked		

CONTAINERS AND CUBES				
A. Rattles box	**B**. Lifts lid of box (not knocking off/over)	**C**. Tries to take cube out of box	**D**. Manages to take 1 cube out of box	**E**. Removes both cubes from box
F. Opens 2 boxes	**G**. Puts 1 cube in box (encourage)	**H**. Puts 2 cubes in box (encourage)	**I**. Puts cubes in and out of box	**J**. Puts lids back, trial and error
K. Puts 2 cubes and lid back	**L**. Puts lid back, adjusts lid to box	**M**. Puts 3 boxes together	**N**. Assembles boxes by colour	
EH 15	Score (count number of boxes ticked)			

COIN BOX					
A. Picks up coin any method R L	**B**. Picks up coin between thumb and finger R L	**C**. Can put coin in the box (slot horizontal) R L	**D**. Can put coin in rotated box (slot vertical) shakily R L	**E**. Can put coin in rotated box: easily R L	**F**. Puts in 6 coins in rotated box R L

EH 16	Score (count number of ticks)	
EH 17 R 6 Rotated box	**a)** Trial 1(secs)	
	b) Trial 2(secs)	
	c) Trial 3(secs)	
EH 18 L 6 Rotated box	**a)** Trial 1(secs)	
	b) Trial 2(secs)	
	c) Trial 3(secs)	

BEAD THREADING Yes/NO		
EH 19	Picks up beads with pincer grasp	
EH 20	Drops beads into container	
EH 21	Threads 2 beads onto shoe lace	
EH 22	How many in 30 secs. **a)** Trial 1	
	b) Trial 2	
	c) Trial 3	

PAPER AND PEN		
Score		Yes/NO
EH 23	Holds a pen in any way	
EH 24	Holds a pen between finger and thumb	
EH 25	Can scribble using a pen	
EH 26	Can imitate a straight line	
EH 27	Can imitate a circle	

Appendix I: The Developmental Milestones Checklist (DMC)

DEVELOPMENTAL MILESTONES CHECKLIST

Start time: **[____:____]**

Key to Coding***

2. Has been able to carry out the activity in the last one month
1. Starting to learn the activity
0. Not yet started
99. Parent/ caregiver cannot tell / recall/ has not observed.

*** The coding system differs slightly for some language items.

LOCOMOTOR

Head Control (Okuzanyisa omutwe)		
DLM01	Holds head erect for a few minutes Ayimiliza omutweegwe wagulu okumala edakika eziweelako	
DLM02	Controls the head Atenge gelela omutwee gwe	
Sitting (Okutuula)		
DLM03	Sits supported Atuula nga bamuzizise	
DLM04	Sits alone on the floor Atuula Yeka	
Crawling (Okwavuula)		
DLM05	Crawls Ayavuula	
KUSIMAMA(STANDNG)		
DLM06a	Pushes down with feet on the floor when held. (this is expected to happen as early as 6 weeks and can emrge even before porper head control of ability to sit) Asindika Ebigele nga ogezaako okumuyimiliza	
DLM06b	Stands when held up (more advanced than the earlier one because you have to have scores atleast a one on DLM04, in this item the child must be able to balance their weight. Ayimilila nga omukute	
DLM 07	Pulls self while holding on to object into a standing position Yesikila ku bintu nayimilila	
DLM 08	Stands holding on to furniture or object Ayimilila ku bintu	
DLM 09	Stands alone Ayimilila yeka	
Walking (Okutambula)		
DLM 10	Walks when held Atambula nga bamukute ko	
DLM 11	Walks alone Atambula yeka	

Climbing (Okwambuka)		
DLM 12	Climbs onto a low chair Ayambuka ku ntebe enyimpi	
DLM 13	Climbs out of a low chair Asobola okuka okuva ku entembe enyimpi	
Others (Ebilala)		
DLM 14	Runs Aduka	
DLM 15	Jumps Abuuka	
DLM 16	Kicks ball while standing Asaamba akapila nga ayimilide	
DLM 17	Throws ball Akanyuga akapila	
DLM18	Can walk backwards. Atambula nga adaemabega	
DLM19	Can stand on one leg for atleast one second Ayimila ku kugulu okumu okumala akatiki kamu	
DLM20	Can go down steps while standing Akilila amadala nga yimilide	

FINE MOTOR

Watching and Reaching (Okwetegereza no Okukwata)		
DFM01	Watches a moving item in front of face Asobola okula ebintu ebitambula mu maasoge	
DFM02	Reaches out for objects unsuccessfully Akunukiliza nga agezaako okufuna ebintu	
DFM03	Reaches out and grasps objects Akunukiliza nakwata ebintu	
KUOKOTA (PICKING)		
DFM04	Picks up small objects in anyway Asobola okulondda ebintu ebitono	
DFM05	Picks up small objects using one hand rather than two Asobola okulonda ebintu nga akozesa omukono gumu	
DFM06	*Picks grains* Asobola okulonda ebintu nga omukyere	
KUANDIKA (WRITING) (here the use of a stick to scribble on the ground should be allowed).		
DFM07	Holds a pen in anyway (very important that the child shows intent to write) Akwaata peni mungeri yoona	
DFM08	Holds a pen between finger and thumb Akwaata peni wakati wolugalo ne ekinkumu	
DFM09	Scribbles with a pen Agegenya okuwandika en peni	
KUFUNGUA (OPENING)		
DFM10	Opens a door that requires pushing. Asobola okuguulawo olugi olwetagisa okusindika	

DFM11	Opens a door by turning and pulling doorknob. Asobola okugula olugi nga ayode omu nyolo	
MENGINEYO		
DFM12	Huweza kufungua chakula ama zawadi zilizofungwa (loosely wrapped ikibidi unaweza mwambie mama ajaribu na mtoto.) Asobola okugulawo/ okusumulula enkintu nga sikinweeze	

LANGAUGE

PRE-SPEECH		
DL01	Repeats vowels in strings e. g. aa aa aa	
DL02	Repeats syllables in strings e. g. ma ma ma , ba ba ba baba	
DL03	Uses synonyms e. g. tamu tamu for sweet foods, mma - maji	
DL04	Uses onomatopes. These are words that describe sounds in a particular situation. E. g. mee for goat, boo for cow, wowo for dog	
DL05	Uses gestures to communicate	
WORDS		
DL06	Uses one definite word Asobola Okwogera ekigambo ekimu	
DL07	Says more than three words Asobola okwogera ebigambo ebisuka mu bisaatu	
DL08	Says more: 3 or less = 0 4-10 words = 1 More than 10 = 2	
DLO8b	Record the exact number of words the mother reported the child can say. Waandika enumber ye bigaambo mama woomwana byagambe nti ayogeera	
DL09	Uses two words combinations Asobolo okwogeera nga agasee ebigambo bibiri	
NAMING & IDENTIFICATION		
DL10	Identifies familiar objects Asobola okwaawula ebintu ebimu kubilala 0 = 0 1-10 items = 1 More than 10 = 2	
DL10b	Record the exact number of items the mother reported the child can identify. Wandika omwendo gwe bigambo mama wo omwana byagambye nti asobola okwaawula	
DL11	Names familiar objects Asobola okwo gera amanyaa gwe bintu 0 = 0 1- 10 items = 1 More than 10 = 2	
DL11b	Record the exact number of items the mother reported the child can name. Wandika omwendo gwe bigambo mama wo omwana byagambye nti	

	asobola okwogera	
DL12	When you ask your child to give you something they are able to Bwo musaaba okukuwa ekintu kyo na omwana wo a sobola okukikuwa	
DL13	Your child can point (eyes, nose, mouth,ears,hands, fingers and teeth) Asobola okusonga ku maaso, enyindo, omumwa, amaaatu,emikono,engaalo na maanyo 0 = 0 1- 10 items = 1 More than 10 = 2	
DL13b	Record the exact number of body parts the mother reported the child can name. Wandika omwendo gwe bitundu bwo mubili mama wo omwana byagambye nti byamanyi	
LANGUAGE: ADDITIONAL ITEMS		
DL14	Startled by loud voices Yekanga amalobozi agawogana	
Dl15	Understands when told no Ategela nga omugaanye okukola eknitu	
DL16	Understands simple instructions like come here, go away, Agobelela byomugambye akole	

PERSONAL –SOCIAL

REACTION TO OTHERS		
DPS01	Regards person: fleeting	
DPS02	Follows moving person with eyes Agobeleze abantu abatambula naamaso	
DPS03	Smiles Aseseka	
DPS04	Vocalizes when talked to Egegenya and oyogede naye	
KUTAMBUA WENGINE (RECOGNITION OF OTHERS)		
DPS05a	Recognises the mother, they are comforted by the mother's presence. Amanyi Mama we era awulila eddembe nga waali.	
DPS05b	Recognises the mother turns around and looks for the mother when he/she hears her voice/ when he/she sees her Amanyi mama we oba wawulila edobozi lye akyuka namunonya	
DPS06	Knows strangers from familiar people Ayawula wakati wa bantu baamanyi ne batamayi	
DPS07	Reaches out for familiar people Ayayanila oba ye tanyila abantu baa manyi	
DPS08	Goes happily with people she/he knows Asobola okugenda nabantu bamayi nga musanyufu	
UTAMBUZI WA KIBINAFSI(SELF RECOGNITON)		
DPS09	Reacts to own name (i.e. responds or turns around when called by name) Bwomuyita erinya lye a kyuuka	
KUJUMUIKA KATIKA MICHEZO NA WENZAKE (PLAY)		
DPS10	Shows an interest in what others are doing.	

	Anumirwa okulaba abalala bye bakola	
DPS11	Watches others and plays next to them. Bwalaba abaana abalala nga bazanya asobola okuzanya kumpina bo	
DPS12	Joins other children in play Azanya na abaana a balala	
DRESSING		
DPS13	Tries to help dress arms into a shirt or blouse. Bwoba omwambaza ye yambako oku tekamu emikono	
DPS14	Undresses self Ye yambula mu ngoye	
DPS15	Dresses self with minimal assistance Yeyambaza nga omuyambe ko ko	
DPS16	Dresses self without any assistance. Yeyambaza yeka	
EATNG & DRINKING		
DPS17	Takes liquids from cups when held to lips Asobola okunwa nga otadde a kikopo ku mu mwagwe	
DPS18	Drinks from a cup with assistance Yenwesa ku kikopo nga omuyambeko	
DPS19	Can manage a cup well. Yenwesa ku kikopo bulungi	
DPS20	Uses hands to feed self: spillage Yelisa nengalo naye yeyila	
DPS21	Uses hands to feed self: no spillage Yelisa nengalo nga teyeyilide	
DPS22	Uses spoon to feed self: spillage Yelisa nekijjiko naye yeyila	
DPS23	Uses spoon to feed self: no spillage Yelisa nekijjiko nga teyeyilide	
KUJISAIDIA (SOILING)		
DPS24	Usually stays dry and clean for up to an hour Asobola okweekuma nga teyeyononye okumala esaawa namba	
DPS25a	Usually indicates when wants to pee. Akulaga nti ayagala kufuka	
DPS25b	Indicates when wet Akulaga nti yeefukide	
DPS 26	Usually says when pressed (wants to go for a short call). Akugamba nga ayagala kufuuka	
DPS 27	Bowel control complete, rarely dirty by day (here we are inquiring if the child is fully toilet trained) Yetwala mu toyi bulungi nga teyeyononye	

DPS 28A: Are there any concerns regarding the *child's growth and development*? Waliwo akikwelalikiliza ku kukula kwomwana wo

Yes - Yee [ ] No -Needa [ ]

DPS28B: : (If yes, tell her to explain) Bwa ba A kiriza Mugamba Anyonyole kya tegeeza

_____
_____
_____
_____
_____

DS 29A. Is there anything you expect your child to be able to do that they do not do? Waliwo kyosubira omwana okuba nga akola naye nga takikola?
Yes - Yee [ ] No -Needa [ ]

DPS29B: (If yes, tell her to explain) Bwa ba A kiriza Mugamba Anyonyole kya tegeeza

_____
_____
_____
_____
_____

DPS30A. Is there anything a child does that worries you? Waliyo ekilala kyona e kikwelaliziliza ku mwanawo
Yes - Yee [ ] No -Needa [ ]

DPS30B: (If yes, tell her to explain) Bwa ba A kiriza Mugamba Anyonyole kya tegeeza

_____

_____

_____

_____

_____

Appendix J: Ethical Clearance Letter: S12/07/191

UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot • your knowledge partner

Approval Notice
New Application

17-Aug-2012
Kizito, Simon S
Stellenbosch, WC

Ethics Reference #: S12/07/191
Title: **Postpartrum Depression , Anxiety ,infant Development and Growth in rural Uganda: A Longitudinal Cohort Study.**

Dear Mr Simon Kizito,

The **New Application** received on **18-Jul-2012**, was reviewed by members of **Health Research Ethics Committee 1** via Expedited review procedures on **14-Aug-2012** and was approved.
Please note the following information about your approved research protocol:

Protocol Approval Period: **14-Aug-2012 -14-Aug-2013**

Please remember to use your **protocol number** (**S12/07/191**) on any documents or correspondence with the REC concerning your research protocol.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:
Please note a template of the progress report is obtainable on www.sun.ac.za/rds and should be submitted to the Committee before the year has expired.
The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number projects may be selected randomly for an external audit.
Translation of the consent document in the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372
Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel: +27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.
For standard REC forms and documents please visit: www.sun.ac.za/rds

If you have any questions or need further help, please contact the REC office at 0219389657.

Included Documents:
Checklist
Consent Form
Investigators declaration
Application Form
Protocol
Synopsis

Sincerely,

Franklin Weber

REC Coordinator
Health Research Ethics Committee 1

Appendix K: Ethical Clearance Letter UNCST: SS 3021

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

Our Ref: SS 3021 **24th January 2013**

Mr. Simon Kizito
Department of Mental Health and Community Psychology
School of Psychology
Makerere University
Kampala

Dear Mr. Kizito,

RE: RESEARCH PROJECT, "POSTPARTUM DEPRESSION AND ANXIETY AND THEIR ASOCIATION WITH INFANT DEVELOPMENT AND GROWTH IN RURAL UGANDA: A LONGITUDINAL COHORT DESIGN"

This is to inform you that the Uganda National Council for Science and Technology (UNCST) approved the above research proposal on **13th December 2012.** The approval will expire on **13th December 2013.** If it is necessary to continue with the research beyond the expiry date, a request for continuation should be made in writing to the Executive Secretary, UNCST.

Any problems of a serious nature related to the execution of your research project should be brought to the attention of the UNCST, and any changes to the research protocol should not be implemented without UNCST's approval except when necessary to eliminate apparent immediate hazards to the research participant(s).

This letter also serves as proof of UNCST approval and as a reminder for you to submit to UNCST timely progress reports and a final report on completion of the research project.

Yours sincerely,

Leah Nawegulo
for: Executive Secretary
UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

LOCATION/CORRESPONDENCE

Plot 6 Kimera Road, Ntinda
P. O. Box 6884
KAMPALA, UGANDA

COMMUNICATION

TEL: (256) 414 705500, (256) 312 314800
FAX: (256) 414-234579
EMAIL: infc@uncst.go.ug
WEBSITE: http://www.uncst.go.ug

Appendix L: Ethical Clearance Letter SHSREC: REF 2012-023

MAKERERE UNIVERSITY
P.O. Box 7072 Kampala, Uganda
E-mail: iokullo@chs.mak.ac.ug
deanshs@chs.mak.ac.ug
Tel: 256 782 303625
Tel: 256 414 531533
Fax: 256 414 531533

COLLEGE OF HEALTH SCIENCES
SCHOOL OF HEALTH SCIENCES
OFFICE OF THE DEAN

December 4th, 2012

Mr. Kizito Simon
School of Psychology
Department of Mental Health and Community Psychology
Makerere University

Category of review
[X] Initial review
[ ] Continuing review
[ ] Amendment
[ ] Termination of study
[ ] SAEs

Dear Mr. Kizito

Re: **Approval of Proposal #SHSREC REF 2012-023**
"Postpartum depression, anxiety, infant development and growth in rural Uganda: A longitudinal cohort study"

Thank you for submitting an application for approval of the above – referenced.
The committee reviewed it and granted approval for 1 year, effective 4th December, 2012.
Approval is valid until 3rd, December, 2013.

Continuing Review
In order to continue work on this study (including data analysis) beyond the expiration date, the School of Health Sciences Research and Ethics Committee must reapprove the protocol after conducting a substantive, meaningful, continuing review.
This means that you must submit a continuing report form as a request for continuing review. To best avoid a lapse, you should submit the request six (6) to eight (8) weeks before the lapse date. Please use the forms supplied by our office.

Amendments
During the approval period, if you propose any change to the protocol such as its funding source, recruiting materials, or consent documents, you must seek School of Health Sciences Research and Ethics Committee approval before implementing it.

Please summarize the proposed change and the rationale for it in a letter to the School of Health Sciences Research and Ethics Committee. In addition, submit two (2) copies of an updated version of your original protocol application- one showing all proposed changes in bold or 'track changes,' and the other without bold or track changes.

Reporting

Other events which must be reported promptly in writing to the School of Health Sciences Research and Ethics Committee include:

Suspension or termination of the protocol by you or the grantor

Unexpected problems involving risk to participants or others

Adverse events, including unanticipated or anticipated but severe physical harm to participants.

Do not hesitate to contact us if you have any questions. Thank you for your cooperation and commitment to the protection of human subjects in research.

Final approval is to be granted by Uganda National Council for Science and Technology.

Documents approved for use along with protocol:

- English and the translated version informed consent forms
- Questionnaires

MAKERERE UNIVERSITY
SCHOOL OF HEALTH SCIENCES
APPROVED
VALID UNTIL
★ 3 DEC 2013 ★
RESEARCH & ETHICS COMMITTEE
P. O. BOX 7072, KAMPALA

Yours sincerely,

Mr. Paul Kutyabami

Chairperson, School of Health Sciences Research and Ethics Committee

MAKERERE UNIVERSITY

P.O. Box 7072 Kampala, Uganda

Tel: +256 782 303625
Tel: +256 414 531533
Fax: + 256 414 531533

E-mail: iokullo@chs.mak.ac.ug
deanshs@chs.mak.ac.ug

COLLEGE OF HEALTH SCIENCES
SCHOOL OF HEALTH SCIENCES
OFFICE OF THE DEAN

MAKERERE UNIVERSITY
SCHOOL OF HEALTH SCIENCES
APPROVED
VALID UNTIL
23 MAR 2015
RESEARCH & ETHICS COMMITTEE
P. O. BOX 7072, KAMPALA

March 24, 2014

Mr. Simon Kizito
Department of Mental Health and Community Psychology
School of Psychology
Makerere University

Category of review
[ ] Initial review
[X] Continuing review
[ ] Amendment
[ ] Termination of study
[ ] SAEs

Dear Mr. Kizito,

Re: Research proposal entitled: "Postpartum Depression, Anxiety, Infant Development and Growth in Rural Uganda" SHSREC Ref No. 2012-023

Renewal Approval Date: 24th March, 2014
Project Expiration Date: 23rd March, 2015

On behalf of the committee, I write to inform you that the proposed extension has been approved.

The Makerere University School of Health Sciences Research and Ethics Committee (SHSREC) initially reviewed and approved the above-referenced protocol on 04th December, 2012. Approval of this protocol expired on 03rd December, 2013.

The review by the committee has found that your renewal is consistent with the continued protection of the rights and welfare of human subjects which protection of human subjects is a partnership between the Research and Ethics Committee (REC) and the investigators. We look forward to working with you as we both fulfill our responsibilities.

Renewals: REC approval is valid until the expiration date given above. If you are continuing your project, you must submit an Application for renewal at least six (6) to eight (8) weeks before the lapse date. If the project is completed, please submit an application for permanent closure.

Amendments: The REC must review any changes in the project, prior to initiation of the change. Please submit an Application for Amendments to have your changes reviewed and

summarize the proposed change and the rationale for it in a letter to the School of Health Sciences Research and Ethics Committee. If changes are made at the time of renewal, please include an Application for Amendments with the renewal application.
In addition, submit two (2) copies of an updated version of your original protocol application- one showing all proposed changes in bold or 'track changes,' and the other without bold or track changes.

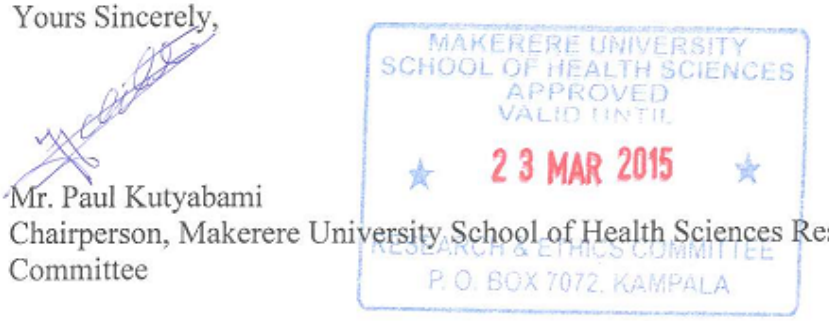
Adverse Events: If issues should arise during the conduct of the research, such as unanticipated problems, severe adverse events or any other problem that may increase the risk to the human subjects, notify the REC Chairman promptly. The forms are available to report these issues.

Please use the REC REF number listed above on any forms submitted which relate to this project/study.

Final approval is to be granted by Uganda National Council for Science and Technology.

Good luck in your research. If we can be of further assistance, please contact us at (+256) 0200903786 (+256) 772404970 or via email at healthsciences.irb@gmail.com. Thank you for your cooperation.

Yours Sincerely,



Mr. Paul Kutyabami
Chairperson, Makerere University School of Health Sciences Research and Ethics Committee

Appendix M: Consent Forms

ENGLISH VERSION
FORM A: Informed Consent Form for Adult Study Participants
PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM
TITLE OF THE RESEARCH PROJECT: Postpartum Depression, GAD, Infant psychomotor development and Growth in Rural Masaka District, Uganda: A Longitudinal Cohort study

REFERENCE NUMBER: (to be assigned)

PRINCIPAL INVESTIGATOR: Kizito Simon (PhD candidate)

ADDRESS: Psychology Department, Faculty of Arts and Social Sciences, Stellenbosch University South Africa

CONTACT NUMBER:
+256 772 925 186 (Ugandan Cell)
+27735902469 (South African Cell)

CANDIDATE'S SUPERVISOR:
Professor Mark Tomlinson,
Psychology Department, Faculty of Arts and Social Sciences, Stellenbosch University, South Africa

CONTACT NUMBER:
(Office): 021-8083446 (Cell). 083-3014868

You are being invited to take part in a research project. Please take some time to read the information on this form, which will explain the details of this project. Please ask me any questions about any part of this study that you do not fully understand. It is very important that you clearly understand what this research is about and how you could be involved. Also, whether or not you choose to be involved in this study is completely up to you. No one is forcing you to take part. If you say no, this will not affect you negatively in any way. You are also free to change your mind at any point, even if you do agree to take part in the beginning.

This research study has been approved by the **Health Research Ethics Committee in the Faculty of Health Sciences at Stellenbosch University. Their Contact details: +27 21 9389140, Fax +27 21 931 3352, email: carlis@sun.ac.za.** In addition, the study will be conducted in accordance with the ethical guidelines and principles of the International Declaration of Helsinki as well and ethical guidelines for research of the **Uganda National Council for Science and Technology (UNCST). The contact details for UNCT: +256 414 250 499/+256 414 705 500, Fax +256 412 234 579, email: uncst@starcom.co.ug.**

What is this research study all about?
The aim of this study is to find out whether the way you feel sad, happy or worried after childbirth affects the growth and or development of your child. The study will be conducted among mothers like you and their infants in Masaka District in Uganda. It will involve having

an interview with you when the infant is six weeks old and a follow-up interview when the infant is six months old. The infant will be measured for height and weight at six weeks and six months by a professionally trained nurse. The infants will also play with a research assistant using different toys to see if they can perform developmentally age appropriate tasks when they are six months old. Each interview with the mother is estimated to last between 50 – 80 minutes while playing with the infant is estimated to last between 30 - 60 minutes. The information will be kept confidential and be destroyed after serving the purpose for which they will be collected. The information will be used in compiling my PhD thesis in Psychology and also published in relevant academic journals. I hope the information collected will contribute to improving maternal mental health care in Uganda. This study is sponsored by Stellenbosch University, South Africa.

What will be your responsibility?
I will request you to participate in an interview with me, which will involve asking you questions about your current mental health status after giving birth.

Why have you been invited to participate?
You have been invited to participate in the study because you are a mother between the age of 15 and 49, with a baby who is either six weeks old or is about to make six weeks.

Will you benefit from taking part in this research?
The research will not benefit you or your family personally but may contribute to understanding maternal mental health, infant psychomotor development and growth, thus improving maternal mental health in Uganda in the long run. I will provide you with a food voucher for your time and your child will also get a toy.

Are there in risks involved in your taking part in this research?
No harm will come to you through taking part in this study which involves you speaking to a researcher and answering questions on forms. I have requested a clinical psychologist who is not a member of this research team to provide emotional care and further support if required. You may also stop your participation in this research at any time. You are under no pressure to answer all the questions that I am going to ask you.

If you do not agree to take part, what alternatives do you have?
You do not have to take part in this project if you do not want to and you will not be affected in any way if you decide not to be involved.

Who will have access to your information?
The research team will keep any information that is gathered in this study safely and in confidence. Responses provided will not be revealed to your friends, relatives, colleagues or anyone else outside the research team. Information you provide will be used only for the stated research purpose. Data will be password-protected and kept in offices with limited access. If the data are published, you will not be identified by name. The data will be deleted after 2 years following their publication.

Will you be paid to take part in this study and are there any costs involved?
No, you will not be paid to take part in the study. There will be no costs for you if you take part in this study.

Is there anything else that you should know or do?

- You can contact Simon Kizito at telephone +256 772 925 186 if you have further queries or encounter any problems.
- You can contact Professor Mark Tomlinson (supervisor) at telephone 083-3014868 if you have any concerns or complaints that have not been adequately addressed by me.
- You will receive a copy of this information and consent form for your own records.

Declaration by participant

By signing below, I.....agree to take part in a research study entitled: **Postpartum Depression, GAD, Infant psychomotor development and Growth in Rural Masaka District, Uganda: A Longitudinal Cohort study**

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressured to take part.
- I may choose to leave the study at any time and this will not affect me negatively in any way.

Signed at (*place* .....on (*date*).....2013

.....

Signature of participant

Declaration by investigator

I (*name*).....declare that:

- I explained the information in this document to.....
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that s/he adequately understands all aspects of the research, as discussed above.

Signed at (*place*).....on (*date*).....2013

.....

Signature of investigator

LUGANDA VERSION OF CONSENT FORMS
Ekiwandiiko ekya'bo abakiriza okweetaba mu kunonyereza. (Abakulu)

FOMU NO'BUBAKA ERI ABO ABANEETABA MUKUNONYEREZA.

OMUTWE GWEEKYO KYE TUNONYEREZAAKO. Postpartum Depression, GAD, Infant psychomotor development and Growth in Rural Uganda: A Longitudinal Cohort study

REFERENCE NUMBER: (to be assigned)

AKULIRA OKUNONYEREZA: Kizito Simon (PhD candidate)

ENDAGIRIRO: Psychology Department, Faculty of Arts and Social Sciences, Stellenbosch University South Africa

ESSIMU:
+256 772 925 186 (Ugandan Cell)
+27735902469 (South African Cell)

OMUSOMESA/AKULEMBERA OKUNONYEREZA:
Professor Tomlinson Mark,
Psychology Department, Faculty of Arts and Social Sciences, Stellenbosch University, South Africa

ESSIMU:
(Office): 021-8083446 (Cell). 083-3014868

Oyitibwa okwetaba mukunonyereza kuno. Nkusaba otwale obudde osome kiwandiiko kino kubanga kyekinyonyola akawonvu na'kagga kwebyo ebiri mukunonyereza kunno. Ekyo kyonaaba totegedde kibuuze omu kwaabo abanonyereza akuli okumpi kuba kyamugaso nyo gwe okutegera ebikwaata ku kunoonyereza kuno era newo'nakwetabiramu. Okusalawo okweetaba mukunonyereza kuno si kyabukake , kivva jjooli era bwoba tokisiimye dembe lyo. Eri abo abasiimye okwetaba mukunonyereza nabo ba dembe okusalawo okukuvvamu singa bakyusa enddowoza oluvanyuma.

Okunoyereza kuno kukkirizidwa abakulu be ttendendekero lye,obyobulamu mu Stellenbosch Univasite , sawusi afirika. Endagiriro**: +27 21 9389140, Fax +27 21 931 3352, email: carlis@sun.ac.za.** Era kugoberera amateeka agakulira ebyokunoyereza mu gwanga lyafe Uganda aba : **Uganda National Council for Science and Technology (UNCST).** Bali kundagiriro **/ essimu: +256 414 250 499/+256 414 705 500, Fax +256 412 234 579, email: uncst@starcom.co.ug.**

Okunonyereza kuno kukwaata ku ki?
Okunonyerza kuno,kunonya okuzuula oluganda oluli wakati wo'kwerakirira no'kwenyamira nakawere kwafuna nga yaakazaala nekye ki kosa kunkula yomwana azaalidwa. Okunonyereza kugenda kukolebwa kubamaama abali mumasaka district, mugwanga Uganda.

Kugenda kubaamu okwebuuza kumaama nga omwana wa wiki mukaaga era nokuddamu okumwebuuzaako nga omwana wa mwezi mukaaga. Omwana ajja kupimibwa obuzito no'buwanvu kuwiki mukaaga kuddibwemu kumwezi mukaaga.kino kijja kukolebya omusawo(nansi) .Abaana abanonyerezebyako banaazanya no yo anonyereza nga bakozesa ebyokuzanyisa nga ekigenderelwa kyakuzuula oba basobola okukola ebyo ebisubilwa mumwaana owemwezi omukaaga. Okwebuuza kumaama kusubilwa okutwala esaawa emu oba emu nekitundu . Ate okuzanya no'mwaama kujja kutwaala wakati we eddakiika 30 ne sawa. Ebikwata kwaabo benini abetabye mukunoonyereza gamba nga amanya nebirala byakukumibwa nga byakyama. Ebinaava mukunonyereza kuno byakukozesebwa okukuba ekitabo kya digili eyokusatu kko no'kozesebwa mumatendekero aga wagulu era katusuubire nti ebinaavamu binaayamba okutereza ebyobulamu bwabamaama anabaana mu nsi yaffe Uganda Aba Stellenbosch Univasite, South Africa bebawomwe omutwe mukunonyereza kuno.

Gwe obuvunanyizibabo bwebuli wa?
Nja kukusaba odemu ebibuuzo ebyekuusa ku mbera yo eyo bulamu era ne'bwoyisibwa mu bilowoozo olwe'byo byoyisemu mukaseera kano nga wakazaala.

Lwaki oyitibwa okweetaba mu kunonyereza?
Oyitidwa kubanga oli maama ali wakati we'myaaka 15 ne 49 era nga oyina omwana aweza oba asemberedde okuweza wiki/ sabbiiiti mukaaga .

Onaganyilwamu mukweetaba mukunonyereza?
Okunonyereza kuno kuyinza obutakugasa nga omuntu kinoomu naye nekugasa egwanga mukutegeera nti embeera yebilowozo bya maama gyeyinza okukosamu enkula yomwana.Kino mu dda kyandi yamba okutegeza egwanga bweliba liteesa kunsonga zo'kuteereza embera zaabamaama mu gwanga.Bamaama abaneetaba mukunonyereza kuno banafuna akakonge akanakozesebya okufuna ebyokulya era n'omwana anafuna ekyokuzanyisa.

Waliwo obulabe byona obuyinza okukutuukako nga wetaba mukunoonyereza?
Tewali bulabe buyinza kukutuukako nga wetaba mukunonyereza omuli okuddamu ebibuuzo ebibuuzibya oyo anonyereza.Nsabye omukugu mu byo'kubudaabuda atali omu kubanonyereza asobole okukuwa obuyambi singa oba obwetaaze.Okirizibwa okukyusa endowoza yo nova mu kunonyereza kuno singa wekuba mu birowozo. Tokakibwa kudamu bibuuzo byona bye ngenda kubuuza.

Bwoba teweetabe mu kunonyereza kuno,kiki ekidirira?
Simusango obuteetaba mukunonyereza kuno era tekijja kukukosa mungeri yona.

Ani akizibwa okusoma kubiinkwatako?
Timu yabanonyereza yoka yekirizibya okusoma kubikukwatako era no'vunanyizibwa okubikuma nga bya kyaama era nga bwekusifu . Failo ziterekebwa nga tekuli manya wabula enamba ezitegeerwa abanonyereza bokka. Oluvanyuma lye'myaka ebiri failo ezo zookebya era ebizirimu nebisigala nga byakyaama.

Onasasulwa bwonaba okiriza okwetaba mukunonyereza kuno?
Nedda teli muntu agenda kusasulwa kuba akiriza okwetaba mukunonyereza kuno.

Waliwo ekilala kyenteekedwa okumanya?

- Tukilila mwami Simon Kizito ku simu eno 0 772 925 186 singa obaako kyobuuza oba nga ofunye obuzibu .
- Oba yogerako eri kakensa Plofessa Tomlinson Mark (supervisor) kussimu eno 083-3014868 singa byoba wetaaze okumanya sibikumalideeyo.
- Ogenda kusigazaako copi ku kiwandiiko kino nga yiyo.

Okukakasa okweeetaba mu kunonyereza.

Nga nzisaako omukono, nze.....nzikiriza okwetaba mukunonyereza kuno okulina omwetwe omukulu guno **:**Postpartum Depression, GAD, Infant psychomotor development and Growth in Rural Uganda: A Longitudinal Cohort study

Era nkakasa nti nti

- Nsomye Ekiwandiiko kino oba bansomede Ekiwandiiko kino ekiri mululimi lyentegera obulungi..
- Mperedwa omukisa okubuuza ebibuuzo era ebibuuzo byange bidibwamu bulungi.
- Nkitegedde nti okwetaba mukunonyera kuno tekukakibwa era teli ankase kukwetabamu.
- Nzikiribwa okuvva mu kunonyereza kuno ekiseera kyonna singa nekuba mundowooza era nga sikosebwa mungeri yona.

Kiteekedwako'mukono nga……...2013

Ekifo ……..

Omukono gyo'yo eyetabye mu kunonyereza.

Akulira okunonyereza

Nze.....nkakasa nti:

- Obubaka obuli mukuwandiiko kino nsobodde okubunyonyola eri.....
- Muwadde obudde nebiseera ebimala okusobola okuddamu ebibuuzo bino
- Ndi mumativu nti ategende bulungi ebikwaata ku kunonyereza kuno nga bwe bilambuludwa wagulu

Kiteekedwako omukono nga…….....2013

Ekifo…….....

...

Omukono gyo'yo akulira abanonyereza

Ekiwandiiko ekikiriza omwana okwetaba mu kunonyereza.(Kisibwako omukono gyo'mukulu)

FOMU NO'BUBAKA ERI ABO ABANEETABA MUKUNONYEREZA

(ESSIBWAKO OMUKONO GWOMUZADDE)

OMUTWE GWEEKYO KYE TUNONYEREZAAKO. Postpartum Depression, GAD, Infant psychomotor development and Growth in Rural Uganda: A Longitudinal Cohort study

REFERENCE NUMBER: (to be assigned)

AKULIRA OKUNONYEREZA: Kizito Simon (PhD candidate)

ENDAGIRIRO: Psychology Department, Faculty of Arts and Social Sciences, Stellenbosch University South Africa

ESSIMU:
+256 772 925 186 (Ugandan Cell)
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OMUSOMESA/AKULEMBERA OKUNONYEREZA:
Professor Tomlinson Mark,
Psychology Department, Faculty of Arts and Social Sciences, Stellenbosch University, South Africa

ESSIMU:
(Office): 021-8083446 (Cell). 083-3014868

Osabibwa okukiriza omwano wo yeetabe mukunonyereza. Nkusaba otwale obudde osome kiwandiiko kino kubanga kyekinyonyola akawonvu nakagga kwebyo ebiri mukunonyereza kunno. Ekyo kyonaaba totegedde kibuuze omu kwaabo abanonyereza akuli okumpi kuba kyamugaso nyo gwe okutegera ebikwaata ku kunoonyereza kuno era newo'nakwetabiramu. Okusalawo okweetaba mukunonyereza kuno si kyabukake , kivva jjooli era bwoba tokisiimye dembe lyo. Eri abo abasiimye okwetaba mukunonyereza nabo ba dembe okusalawo okukuvvamu singa bakyusa enddowoza oluvanyuma.

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Okunonyereza kuno kukwaata ku ki?
Okunonyerza kuno,kunonya okuzuula oluganda oluli wakati wo'kwerakirira no'kwenyamira nakawere kwafuna nga yaakazaala nekye ki kosa kunkula yomwana azaalidwa. Okunonyereza kugenda kukolebwa kubamaama abali mumasaka district, mugwanga Uganda. Kugenda kubaamu okwebuuza kumaama nga omwana wa wiki mukaaga era nokuddamu okumwebuuzaako nga omwana wa mwezi mukaaga. Omwana ajja kupimibwa obuzito no'buwanvu kuwiki mukaaga kuddibwemu kumwezi mukaaga.kino kijja kukolebya omusawo(nansi) .Abaana abanonyerezebyako banaazanya nomunonyereza nga bakozesa dolezaabana nga ekigenderelwa kyakuzuula oba basobola okukola ebyo ebisubilwa mumwaana owemwezi omukaaga. Okwebuuza kumaama kusubilwa okutwala esaawa emu oba emu nekitundu . Ate okuzanya no'mwaama kujja kutwaala wakati we eddakiika 30 ne

sawa. Ebikwata kwaabo benini abetabye mukunoonyereza gamba nga amanya nebirala byakukumibwa nga byakyama. Ebinaava mukunonyereza kuno byakukozesebwa okukuba ekitabo kya digili eyokusatu kko no'kozesebwa mumatendekero aga wagulu era katusuubire nti ebinaavamu binaayamba okutereza ebyobulamu bwabamaama anabaana mu nsi yaffe Uganda Aba Stellenbosch Univasite, South Africa beba womwe omutwe mukunonyeteza kuno.

Lwaki omwanawo ayitibwa okwetaba mu kunonyereza?
Nsaba omwana wo yeetabe mu kunonyereza kuno kubanga ngala kuzuula embeere gyo'limu ekosa etya enkula yo'mwana .

Omwana wo anaganyilwamu mukwetaba mukunonyereza?
Okunonyereza kuno kuyinza obutakugasa mwana oba abomumaka naye nekugasa egwanga mukutegeera engeri yo kulabirilamu abaana.

Waliwo obulabe byona obuyinza okutuuka kumwaana nga yeetaba mukunoonyereza?
Tewali bulabe buyinza kutuuka ku mwaamn nga yetaba mukunonyereza.

Bwemba sikiriza mwana wange kweetaba mu kunonyereza kuno,kiki ekidirira?
Si kyateeka nti omwana wo ayina okweetaba mukunonyereza kuno era tajja kukosebwa lwekyo kyosazeewo.

Ani akirizibwa okusoma kubiikwata ku mwana wo?
Timu yabanonyereza yoka yekirizibya okusoma kubikwata ku mwana wo era evunanyizibwa okubikuma nga bya kyaama . Failo zigenda kuterekebwa mu office ya Stellenbosch univasite era failo ezo zookebye nga okunonyereza kuwedde ebizirimu nebisigala nga byakyaama.

Omwana wo anaasasulwa kubanga yeetabye mu kukunonyereza kuno?
Nedda teli muntu agenda kusasulwa kuba akiriza okwetaba mukunonyereza kuno naye maama anawebwa akakonge kemmere nomwana awebye ekyokuzanyisa..

Waliwo ekilala kyenteekedwa okumanya?

- Tukilila mwami Simon Kizito ku simu eno 0 772 925 186 singa obaako kyobuuza oba nga ofunye obuzibu .
- Oba yogerako eri kakensa Plofessa Tomlinson Mark (supervisor) kussimu eno 083-3014868 singa byoba wetaaze okumanya sibikumalideeyo.
- Ogenda kusigazaako copi ku kiwandiiko kino nga yiyo.

Okukakasa kwo'muzadde nti omwana we yeetaba mu kunonyereza.

Nga nsisaako omukono, nze.....nzikirizza omwana wange…….. owa wiki/mwezi……. okwetaba mukunonyereza kuno okulina omwetwe omukulu guno **:**Postpartum Depression, GAD, Infant psychomotor development and Growth in Rural Uganda: A Longitudinal Cohort study
Era nkakasa nti nti

- Nsomye Ekiwandiiko kino oba bansomede Ekiwandiiko kino ekiri mululimi lyentegera obulungi..
- Mperedwa omukisa okubuuza ebibuuzo era ebibuuzo byange bidibwamu bulungi.
- Nkitegedde nti okwetaba mukunonyera kuno tekukakibwa era teali ankase kukwetabamu.
- Nzikiribwa okuvva mu kunonyereza kuno ekiseera kyonna singa nekuba mundowooza era nga sikosebwa mungeri yona.

Kiteekedwako'mukono nga……...2013

Ekifo ……..

Omukono gyo'yo eyetabye mu kunonyereza.

Akulira okunonyereza

Nze.....nkakasa nti:

- Obubaka obuli mukuwandiiko kino nsobodde okubunyonyola eri.....
- Muwadde obudde nebiseera ebimala okusobola okuddamu ebibuuzo bino
- Ndi mumativu nti ategende bulungi ebikwaata ku kunonyereza kuno nga bwe bilambuludwa wagulu

Kiteekedwako omukono nga…….....2013

Ekifo…….....
...

Omukono gyo'yo akulira abanonyereza

Appendix N: Tables of Analysis

Table N1
Household quintiles

Quintile ranks	n (%)
Lowest	33 (19.8)
Second	33 (19.8)
Middle	34 (20.4)
Fourth	34 (20.4)
Highest	33 (19.8)

Table N2.

Prevalence of Maternal Mental Illness at Baseline

Characteristics	n=167(%)
SCID for Mood Disorders	
Depressed	58(34.70)
Not Depressed	109(65.30)
SCID for Anxiety	
Anxious	38(22.80)
Not Anxious	129(77.20)
SCID for Comorbidity of Depression and Anxiety	
Comorbid	27(16.20)
Non Comorbid	140(83.80)
EPDS	
Depressed	67(40.10)
Not Depressed	100(59.90)
SRQ-20	
Distressed	68(40.70)
Not Distressed	99(59.30)

Note. n=number of respondents; %=percentages

Table N3

Maternal AADA and Maternal Characteristics at Six Weeks Postpartum

Characteristics	Anxious n = 38 (%)	Not Anxious n = 129 (%)	X^2	*df*	OR	φ_c	95% CI	*p*
Age			.839	4		.071	(.93-.94)	.932
18-19	7(18.42)	20 (15.50)						
≤ 24	10 (26.32)	43 (33.33)						
25-29	8 (21.11)	28 (21.70)						
30-34	7 (18.40)	20 (15.50)						
35+	6 (15.79)	18 (13.95)						
Marital Status			.439	1		.051		.508
Married	8 (21.05)	34 (26.36)						
Not Married	30(78.95	95(73.64)						
Religious affiliation			3.56	2		.146	(.15-.162)	.156
Catholic	23 (60.53)	56 (43.41)						
Anglican	5 (13.16)	28 (21.71)						
Others	10 (26.32)	45 (34.88)						
Tribe			1.134	2		.082	(.57-.59)	.567
Baganda	24 (63.16)	92 (71.32)						
Banyarwanda	7 (18.42)	16 (12.40)						
Other	7 (18.42)	21 (16.28)						
Education			.404	1	.78	.049		.525
Primary and below	26 (68.40)	81 (62.80)						
Secondary and Post-Secondary	12 (31.60)	48 (37.20)						
Planned pregnancy			1.13	1	1.48	.08		.288
Yes	19 (50.00)	77 (59.70)						
No	19 (50.00)	52 (40.30)						
Parity			.35	1	1.09	.01		.852
Primiparous	8 (21.10)	29 (22.50)						
Multiparous	30 (78.90)	100 (77.50)						
Exclusive Breastfeeding			.47	1	1.08	.05		.495
Yes	30 (78.90)	108 (83.70)						
No	8 (21.10)	21 (16.30)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *p* = significance; Bonferroni correction = .006

Table N4:
Infant's Gender and Maternal Mental Illness at Six Weeks Postpartum

Characteristics	Gender		X^2	*df*	OR	φ_c	*95% CI*	*P*
	Male n = 83 (%)	Female n =84 (%)						
Depression			.72	1	.916	.021		.788
Depressed	28 (48.28)	30 (51.72)						
Not Depressed	55 (46.22)	64 (53.78)						
AADA			.609	1	.749	.060		.435
Anxious	21 (55.26)	17 (44.74)						
No Anxious	62 (48.06)	67 (51.94)						
Comorbidity			1.225	3		.086	(.741-.758)	.747
Comorbid	15 (55.56)	12 (44.44)						
Only Depressed	13 (41.94)	18 (58.06)						
Only Anxious	6 (54.55)	5 (45.45)						
Neither Depressed nor Anxious	49 (50.00)	49 (50.00)						
Psychological Distress			.776	1	1.321	.68		.378
Distressed	31 (45.59)	37 (54.41)						
Not Distressed	52 (52.53)	47 (47.47)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *P* = significance

Table N5:

Poverty and Infant Growth at Six Weeks Postpartum

	Poverty Quintiles	N	M (SD)	df	F	*p*
HAZ				4	1.223	
	Highest	33	-1.061 (1.561)			.303
	Fourth	33	-1.174 (1.573)			
	Middle	34	-1.444 (1.405)			
	Second	34	-1.505 (1.654)			
	Lowest	31	-1.811 (1.320)			.087
WAZ				4	2.071	
	Highest	33	-.051 (1.112)			
	Fourth	33	.065 (1.118)			
	Middle	34	-.556 (1.040)			
	Second	34	-.326 (1.012)			
	Lowest	33	-.543 (1.349)			
WHZ				4	1.023	.397
	Highest	33	.788 (1.296)			
	Fourth	32	.896 (1.249)			
	Middle	34	.347 (1.203)			
	Second	34	.748 (.971)			
	Lowest	33	.807 (1.380)			

Note. WAZ = weight for age Z-score; HAZ = height for age Z-score; WHZ = weight for height Z-score; M = mean; SD = standard deviation; *df* = degrees of freedom; *p* = significance

Table N6

Correlation Coefficients between Relationship Discord, Social Support and Infant Growth at Six Weeks Postpartum

	1	2	3	4	5
1. HAZ	-	.638**	-.122	-.031	-.032
2. WAZ		-	.641**	-.045	-.093
3. WHZ			-	-.050	-.033
4. Relationship Discord				-	-.224**
5. Social Support					-

*Note. **. Correlation is significant at the 0.01 level (2-tailed).*
WAZ = weight for age Z-score; HAZ = height for age Z-score; WHZ = weight for height Z-score;

Table N7.

Prevalence of Maternal Mental Illness at Follow-up

Measure	n=149(%)
SCID for Mood Disorders	
Depressed	21(14.09)
Not Depressed	128(85.91)
SCID for Anxiety	
Anxious	10(6.71)
Not Anxious	139(93.29)
SCID for Comorbidity of Depression and Anxiety	
Comorbid	5(3.36)
Non Comorbid	144(96.64)
EPDS	
Depressed	33(22.15)
Not Depressed	116(77.85)
SRQ-20	
Distressed	35(23.49)
Not Distressed	114(76.51)

Note. n=number of respondents; %=percentages

Table N8.

Association between SCID-I-RV/NP AADA at Six Weeks Postpartum and SCID-I-RV/NP GAD at Six Months Postpartum

	SCID-I-RV/NP AADA at Six Weeks Postpartum						
SCID-I-RV/NP GAD at Six Months Postpartum	Not Anxious n = 119 (%)	Anxious n =30 (%)	X^2	df	OR	φ_c	p
			.000	1	7.12	.001	.991
Not anxious	111 (93.28)	28 (93.33)					
Anxious	8 (6.72)	2 (6.67)					

Table N9:

Infant's Gender and Maternal Mental Illness at Six Months Postpartum

Characteristics	Gender		X^2	*df*	OR	φ_c	*95% CI*	*P*
	Male n = 74 (%)	Female n =75 (%)						
Depression			1.465	1	.560	.099		.226
Depressed	13 (61.90)	8 (38.10)						
Not Depressed	61 (47.66)	67 (52.34)						
GAD			.458	1	.638	.055		.499
Anxiety	6(60.00)	4 (40.00)						
No Anxiety	68 (48.92)	71 (51.08)						
Comorbidity			4.902	3		.181	(.178-.193)	.179
Comorbid	2 (40.00)	3 (60.00)						
Only Depressed	11(68.75)	5 (31.25)						
Only Anxious	4 (80.00)	1 (20.00)						
Neither Depressed nor Anxious	57(46.34)	66 (53.66)						
Psychological Distress			1.955	1	.579	.115		.162
Distressed	21 (60.00)	14 (40.00)						
Not Distressed	53 (46.49)	61 (53.51)						

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; OR = odds ratio; φ_c = Cramer's V; CI = confidence level; *P* = significance

Table N10

Social Support at Six Weeks Postpartum and Maternal Mental Illness at Six Months Postpartum

Maternal Mental illness	Social Support levels		X^2	*df*	φ_c	95% CI	*p*
	Low n=54 (%)	High n=95(%)					
Depression			.121	1	.029		.728
Depressed	6 (15.79)	15 (13.51)					
Not Depressed	32(84.21)	96 (86.49)					
Anxiety			.114	1	.028		.736
Anxious	3(7.89)	7(6.31)					
Not Anxious	35 (92.11)	104 (93.69)					
Psychological Distress			.169	1	.034		.681
Distressed	8(21.05)	27(24.32)					
Not Distressed	30 (78.95)	84 (75.68)					
Comorbidity			.991	3	.082	(.837-.851)	.803
Comorbid	1 (2.63)	4(3.60)					
Only Depressed	5 (13.16)	11 (9.91)					
Only Anxious	2 (5.26)	3 (2.70)					
Neither Depressed nor Anxious	30 (78.95)	93 (83.78)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *P* = significance

Table N11

Social Support at Six Months Postpartum and Maternal Mental Illness

Maternal Mental illness	Social Support levels		X^2	*df*	φ_c	95% CI	*p*
	Low (12-48) n (%)	High (69-84) n(%)					
Depression			2.76	1	.136		.140
Depressed	11 (52.38)	10 (10.53)					
Not Depressed	43 (79.63)	85 (89.47)					
Anxiety			1.224	1	.091		.269
Anxious	2 (3.70)	8 (8.42)					
Not Anxious	52 (96.30)	87 (91.58)					
Psychological Distress			.874	1	.076		.352
Distressed	15 (27.78)	20 (21.05)					
Not Distressed	39 (72.22)	75 (78.95)					
Comorbidity			6.150	3	.203	(.096-.108)	.102
Comorbid	1 (1.85)	4(4.21)					
Only Depressed	10 (18.52)	6 (6.32)					
Only Anxious	1 (1.85)	4 (4.21)					
Neither Depressed nor Anxious	42 (77.78)	81 (85.26)					

Note. n = number of participants; X^2 = chi square; *df* = degrees of freedom; φ_c = Cramer's V; CI = confidence level; *P* = significance

Table N12:

Poverty and Infant Growth at Six Months Postpartum

	Poverty Quintiles							
	Lowest	Second	Middle	Fourth	Highest	df	F	*p*
	n= 28 M (SD)	n= 32 M (SD)	n= 30 M (SD)	n= 28 M (SD)	n= 31 M (SD)			
HAZ	-1.572 (1.122)	-1.636 (.915)	-1.608 (.925)	-1.797 (1.135)	-1.497 (1.357)	4	.292	.883
WAZ	-.335 (1.380)	-.318 (1.111)	-.472 (1.301)	-.336 (1.311)	.004 (1.082)	4	.65	.646
WHZ	.983 (1.500)	1.243 (1.350)	.9123 (1.480)	1.214 (1.238)	1.531 (1.078)	4	1.010	.404

Note. WAZ = weight for age Z-score; HAZ = height for age Z-score; WHZ = weight for height Z-score; M = mean; SD = standard deviation; *df* = degrees of freedom; *p* = significance

Table N13

Correlation Coefficients between Relationship Discord, Social Support and Infant Growth at Six Months Postpartum

	1	2	3	4	5
1. HAZ	-	.638**	-.122	-.031	-.032
2. WAZ		-	.641**	-.045	-.093
3. WHZ			-	-.050	-.033
4. Relationship Discord				-	-.224**
5. Social Support					-

*Note. **. Correlation is significant at the 0.01 level (2-tailed).*